INTRODUCTION



MUL-T-LOCK®

Table of Contents

MUL-T-LOCK®
An ASSA ABLOY Group Company

Key Systems - Classic

Mul-T-Lock® basic cylinder construction and terminology

Mul-T-Lock® cylinders are built and operated on the basic principles of a standard pin tumbler lock mechanism.

A plug, rotating within a shell, turns a tail/cam/gear when pins of various lengths are aligned at a shear line by means of a key. All pins must be elevated to the shear line simultaneously before the plug can turn within the shell.

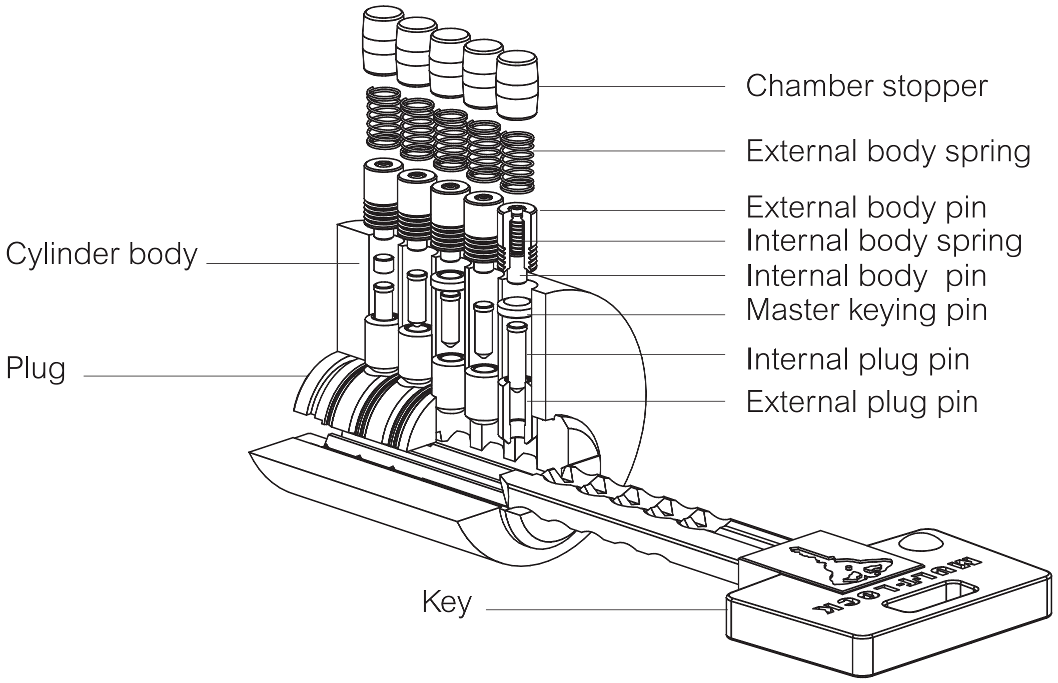
Mul-T-Lock® high-security cylinders have an added unique telescopic pin tumbler mechanism with internal and external pins. Both the internal and the external shear lines must be aligned simultaneously in order for the plug to rotate.

This dual-locking principle and other patented features contribute to Mul-T-Lock's high number of different combinations, master keying capability, and extreme pick resistance.

The standard product has five chambers, containing 10 plug pins and 10 body pins.

Mul-T-Lock® cylinders are also protected against various forms of physical attack by hardened drill-resistant inserts within the shell and the plug, which protect the shear line.

When master keyed, additional side pins or back pins can be incorporated to allow even greater control and flexibility.

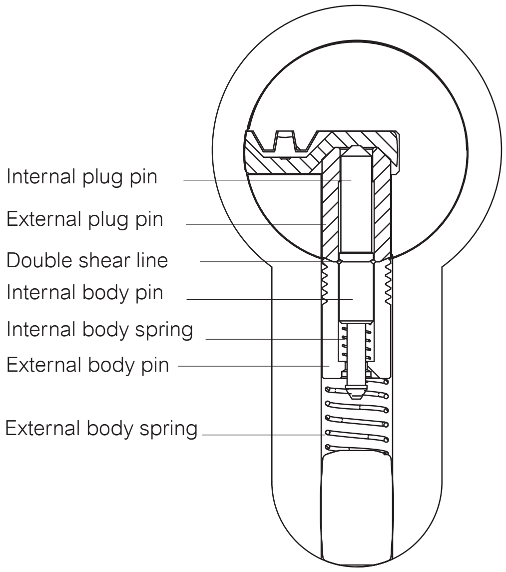


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Pinning concept

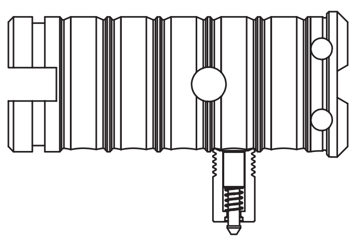
Mul-T-Lock® high security cylinders have a unique telescopic pin tumbler mechanism with internal and external pins.

Both the internal and the external shear lines must be aligned simultaneously in order for the plug to rotate.



Three-dimensional shear line

The Mul-T-Lock® patented plug has a unique structure. When the top and bottom pins, plug and body meet, a three-dimensional shear line is formed to an almost perfectly spherical shape.

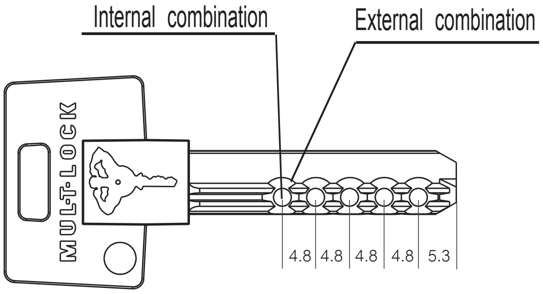


Mul-T-Lock® Classic Key

Mul-T-Lock® keys contain five double dimple cuts to provide two combinations in each chamber: internal and external.

The cuts are numbered from bow to tip, from 1 to 5. The distance from the tip, which is also the key stop, to the center of the fifth cut is 5.3 mm for both LH and RH keys. The spacing (distance from center to center of each cut) is 4.8 mm.

When the cylinder has 4, 3 or 2 chambers, the first cuts are omitted from the cylinder. The key always has all five cuts so that it can fit other products within a keying system.



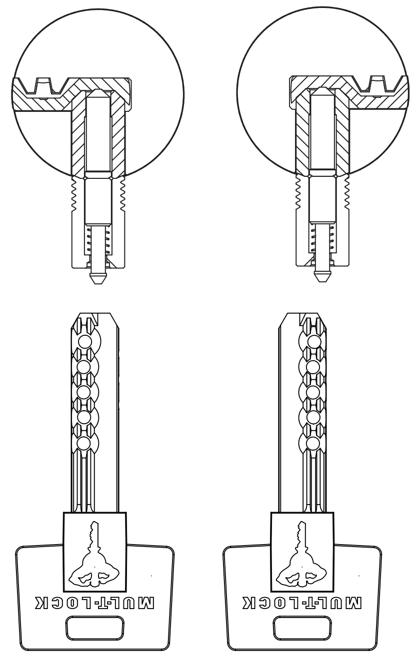
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Determining the key hand

Mul-T-Lock® keys are divided into two major groups according to their profiles: Right Hand (R.H) and Left Hand (L.H).

To determine the key hand, hold the key head with the tip pointing upwards.

If the cuts and/or milling appear on the right, you are looking at a Right Hand key. If the cuts and/or milling appear on the left, you are looking at a Left Hand key.



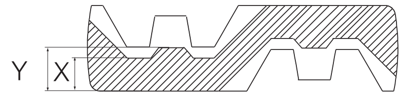
Left Hand profile

Right Hand profile

Measuring key depth

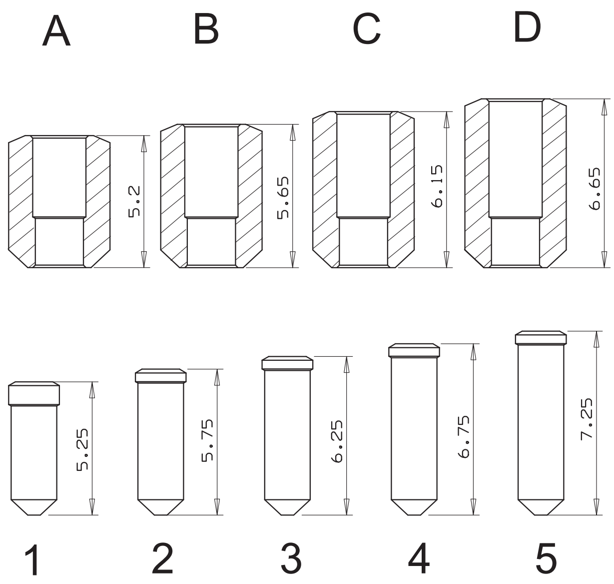
As in ordinary keys, Mul-T-Lock® key cuts are measured from the base (back) of the key to the bottom of the cut.

This means that we actually measure the remaining material of the key, after cutting... see illustration.

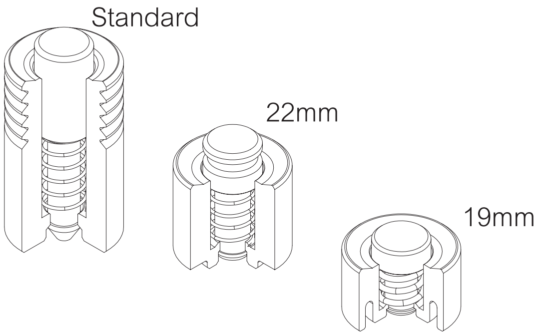


Mul-T-Lock® pins specification

Plug pins:
Material: Nickel silver
Structure: Externals are built in a tube shape, to hold the internals within
Diameter: 4mm for externals; 2mm for internals
Length: From 5.20mm to 7.25mm, in increments (steps) of 0.5 mm



Patented Combined pins (body, driver pins):
Material: Nickel silver for pins, stainless steel for spring
Length: Varies according to product size



Key Systems - Interactive®

Mul-T-Lock® Interactive® system terminology and construction

The Mul-T-Lock® patented Interactive® system raises security levels to new heights. The Interactive® system combines the unique telescopic pin tumbler mechanism and special features of the Mul-T-Lock® Classic system with a spring-loaded pin in the cylinder plug, to produce a 'virtual combination' wich is possible only when the key is inserted in the lock.

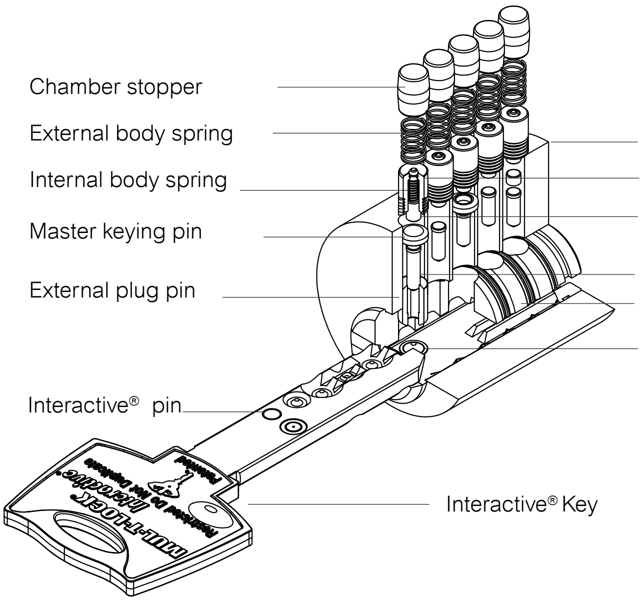
To achieve an even higher level of key security, Interactive® patented keys and key blanks provide increased control over key cutting, Additional keys should be cut only after presentation of a Mul-T-Lock® key registration card and verification of customer identity.

Interactive® technology is retro-compatible with the Mul-T-Lock® Classic system, allowing existing locks to be upgraded.

The standard product has five chambers, containing 10 plug pins and 10 body pins.

Interactive® cylinders are also protected against various forms of physical attack by hardened drill-resistant inserts within the shell and the plug, which protect the shear line.

When master keyed, additional side pins or back pins can be incorporated to allow even greater control and flexibility.

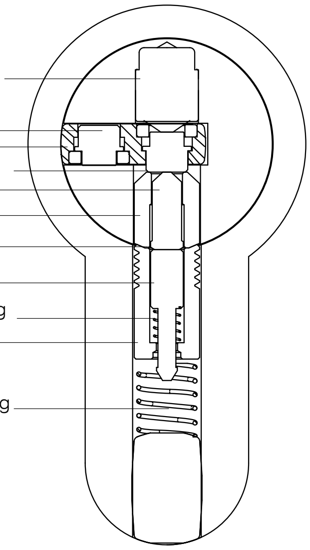


Pinning concept

The Mul-T-Lock® patented Interactive® cylinder adds two new pins to the assortment of code pins. The new pins are shorter than the ones used before in the Classic line (A,1).

They actually work above the 'blank level', creating a virtual combination which can be raised to the shear line only by using a Mul-T-Lock® Interactive® patented key.

The Interactive® chamber may be located in the first or second chamber, and can be A0, Zo, or Z1.

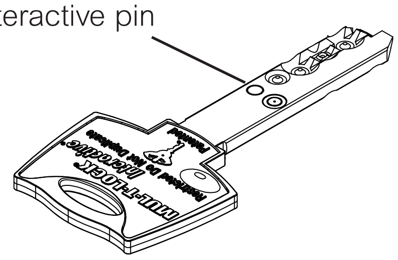


Mul-T-Lock® Interactive® key

The keys in the Interactive® series are cut in the same manner as Mul-T-Lock® Classic keys, with a slight difference.

You only need to cut four positions since the fifth position, the Interactive® pin, has already been embedded at the factory.

The Interactive® key will contain one of the following cuts - A0, Z0, Z1 - which has been embedded into it during the manufacturing process.



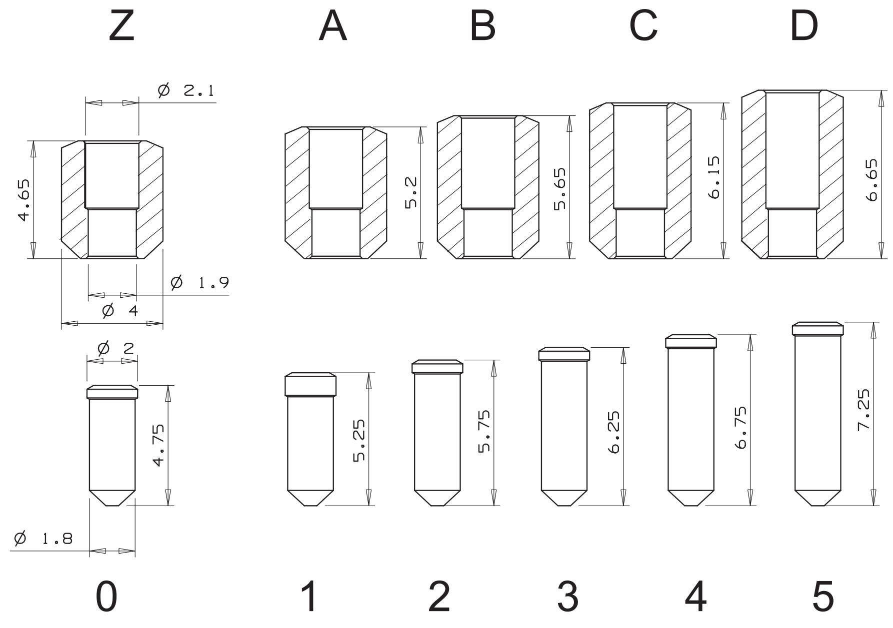
Mul-T-Lock® pins *Interactive®* specification

Two additional pin lengths have been added to the Mul-T-Lock® rekeying kits :
External pin Z (which is 0.5 mm shorter than the A pin)
Internal pin 0 (which is 0.5 mm shorter than the 1 pin)

The *Interactive®* line of products differs from other Mul-T-Lock® products in two ways:

1. The *Interactive®* pin, which is embedded in the patented key during the manufacturing process
2. The spring loaded pin embedded in the plug in the first or second position

Plug pins:
Material: Nickel silver
Structure: Externals are built in a tube shape, to hold the internals within
Diameter: 4mm for externals; 2 mm for internals



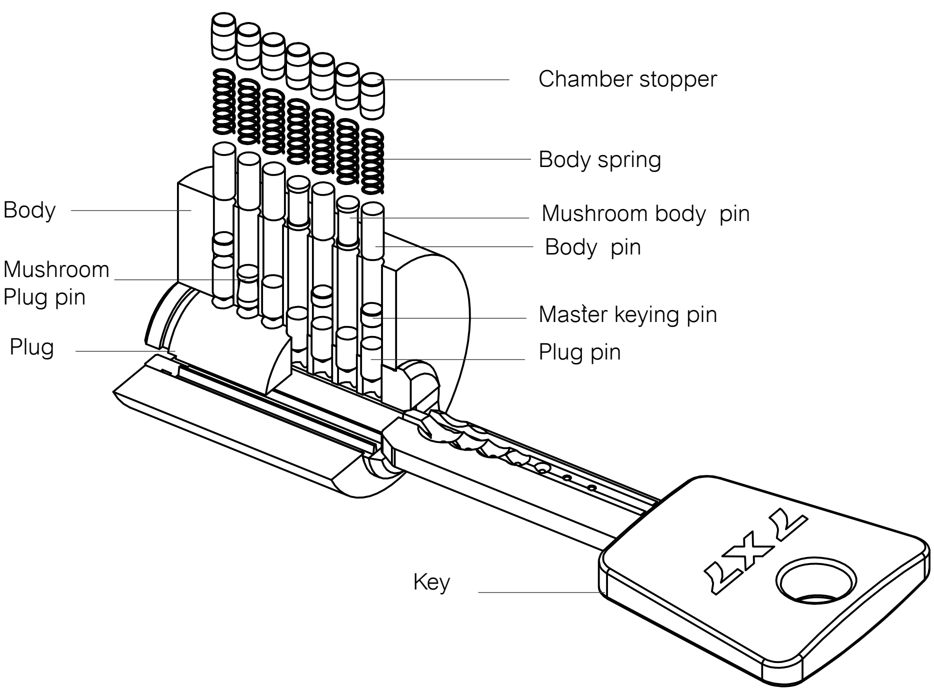
Key Systems - 7X7®

Mul-T-Lock® 7X7® cylinder construction and terminology

Mul-T-Lock® 7X7® is single pin tumbler mechanism, operating on a flat dimple cut key. The pins and keys are made of nickel silver.

A plug, rotating within a shell, turns a tail or cam when pins of various lengths are aligned at a shear line by means of a key.

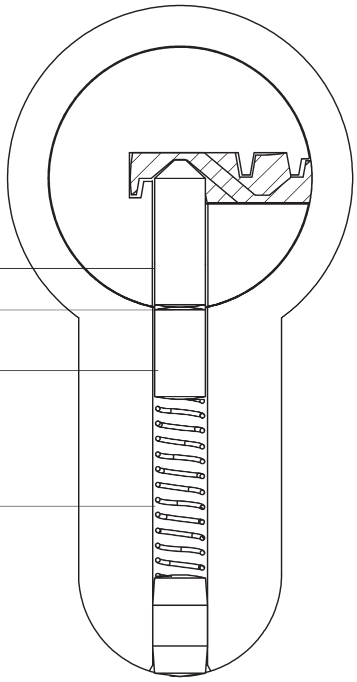
The 7X7® key system standard product comes with 7 chambers, 7 plug pins, and 7 body pins.



Pinning concept

Mul-T-Lock® 7X7® security cylinders have a pin tumbler mechanism.

Pins must be aligned to shear lines in order for the plug to rotate.

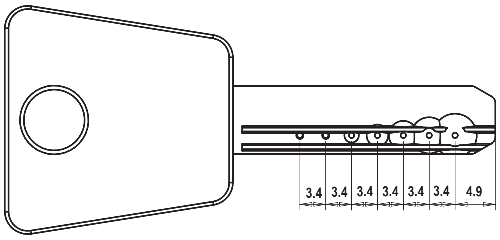


Mul-T-Lock® 7X7® key

Mul-T-Lock® 7X7® keys contain seven dimple cuts.

The cuts are numbered from bow to tip, from 1 to 7. The distance from the tip, which is also the key stop, to the center of the fifth cut is 4.9mm . The spacing (distance from center to center of each cut) is 3.4 mm.

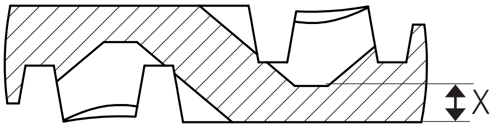
When the cylinder has 4, 3 or 2 chambers, the first cuts are omitted from the cylinder. The key always has all 7 cuts so that it can fit other products within a keying system.



Measuring key depth

As in ordinary keys, Mul-T-Lock® 7X7® key cuts are measured from the base (back) of the key to the bottom of the cut.

This means that we actually measure the remaining material of the key, after cutting... see illustration.

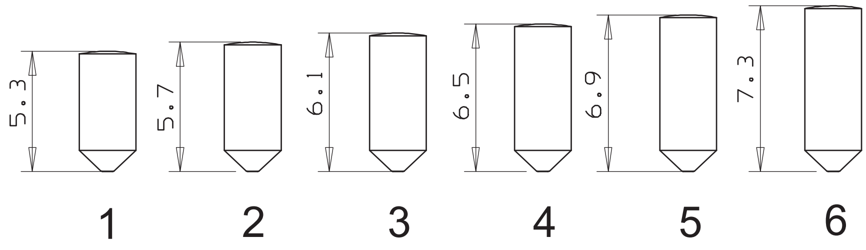


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Mul-T-Lock® 7X7® pins specification

Plug pins:

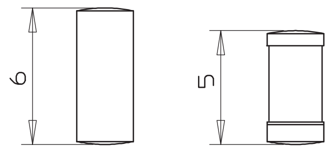
Material: Brass/nickel silver



Body (Driver) pins

Material: Brass/nickel silver.

Length: Varies



Key Systems - Integrator™

Mul-T-Lock® Integrator™ cylinder construction and terminology

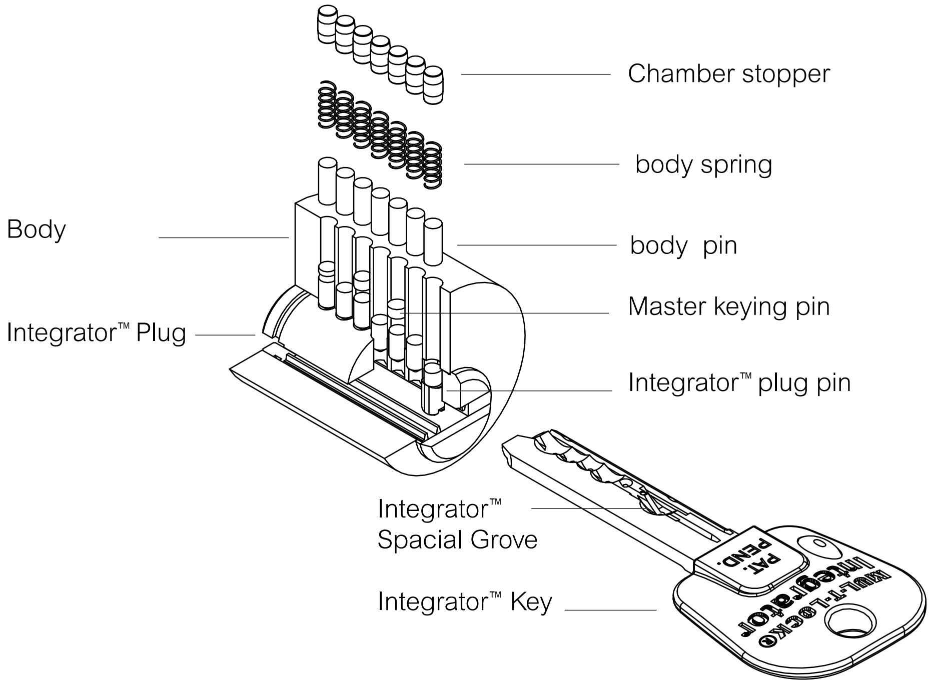
The Mul-T-Lock® patented (and patent pending) Integrator™ system provides the added advantage of a patented protection to key security.

The specially designed Integrator™ pin adds a new dimension to the 7X7® line. For the purposes of master keying, this new dimension can be used for creation of hierarchical levels.

The Integrator™ patented keys and key blanks provide increased control over key cutting. Additional keys should only be cut after presentation of a Mul-T-Lock® key registration card and verification of customer identity.

The Integrator™ technology is retro-compatible with the Mul-T-Lock® 7X7® system, allowing existing locks to be integrated into one system with Integrator™ cylinders

The Mul-T-Lock® Integrator™ standard product has 7 chambers, 7 plug pins and 7 body (driver) pins.



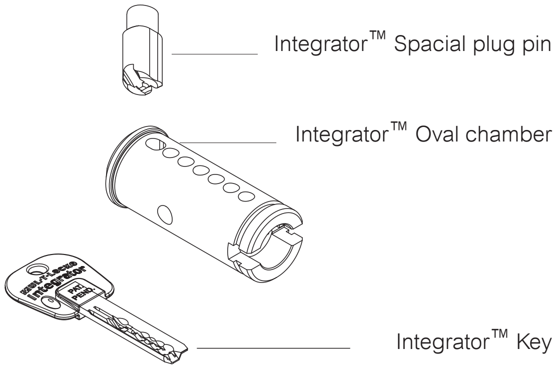
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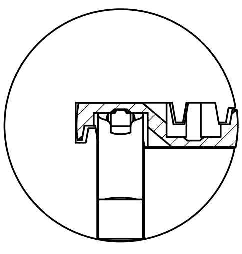
Pinning concept

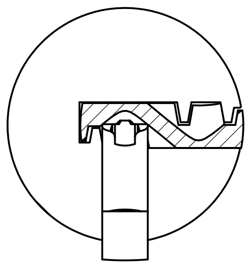
The Mul-T-Lock® patented Integrator™ cylinder adds two new patented plug pins to the standard specification 7X7® code pins, .

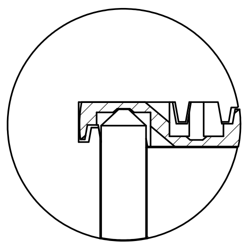
The special three-dimensional structure of the plug pin ensures that only Integrator™ keys are capable of achieving the shear line.

The Integrator™ chamber may be located in one of seven positions.




Integrator™ "M " type key cut in Integrator™ cylinder chamber


7X7® key cut in Integrator™ "M " type cylinder chamber

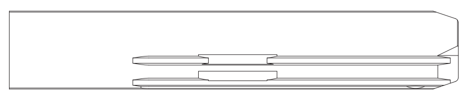

Integrator™ "M " type key cut in 7X7® cylinder chamber

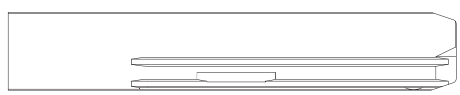
Mul-T-Lock ® Integrator™ key

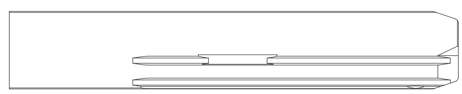
The keys in the Integrator™ series are cut in the same manner as Mul-T-Lock® 7X7® keys, with a slight difference.

You only need to cut six positions since the seventh position, the Integrator™ pin combination, has been pre-cut in the key during the manufacturing process.

The Integrator™ key will contain one of the following cuts:
E-External cut
P-Internal cut
M-Master cut

M-Master cut


E-External cut


P-Internal cut


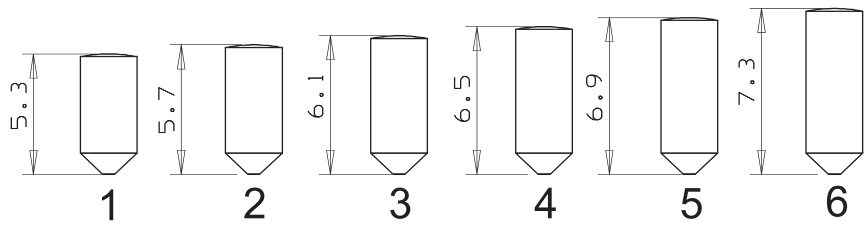
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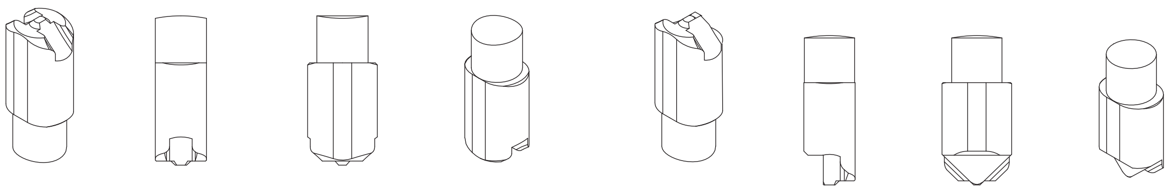
Mul-T-Lock® Integrator™ pins specification

The following pins have been added to the Mul-T-Lock® 7x7® rekeying kits:

- Double Launcher pin for M-type keys.
- Single Launcher pin that can be used for internal or external combination.

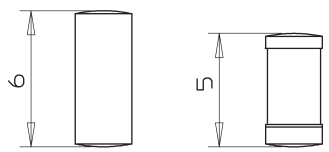
Plug pins:
Material: Brass/nickel silver



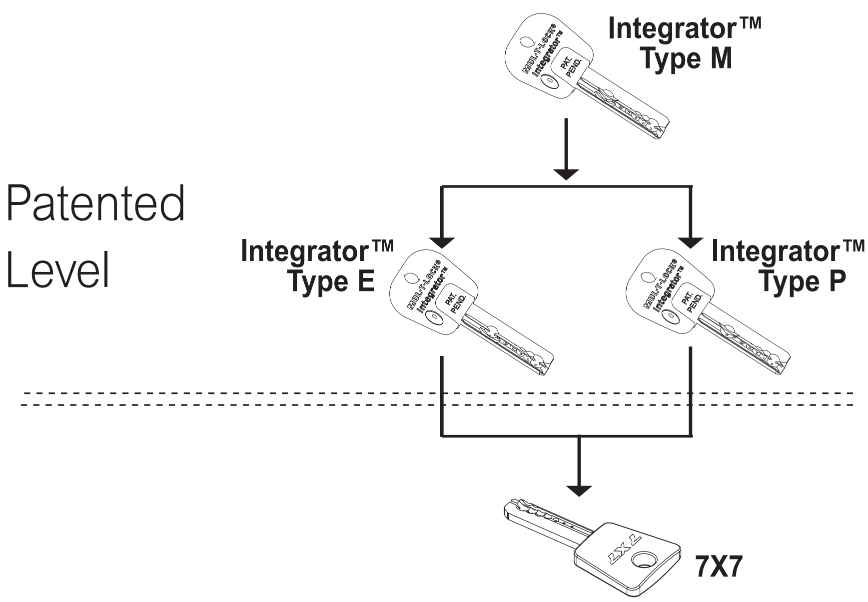


Double Launcher pin   Single Launcher pin

7x7 driver pins:



Key Systems- Integrator™ & 7X7® Systems hierarchy



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CYLINDERS



MUL-T-LOCK®

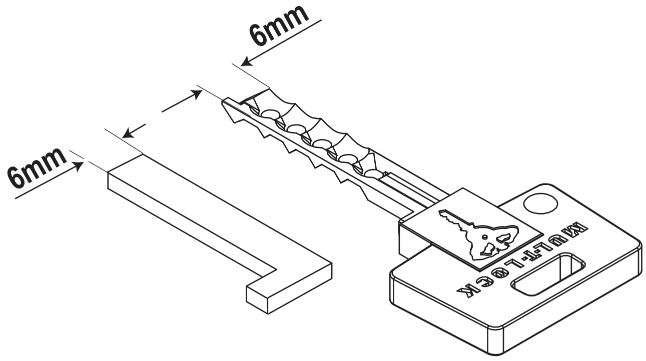
Table of Contents

Cylinders - Servicing
Using "Spring Catcher" and Filed Key

This method is especially effective for servicing double cylinders, enabling you to work on each side at a time.

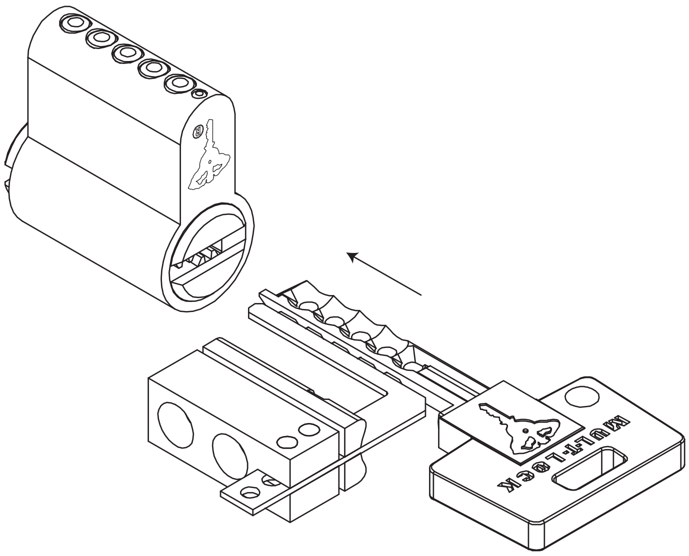
1
File the key to a width of 6mm.

A service (locksmith) key, cut to a width of 6mm, is provided in the pinning kit.



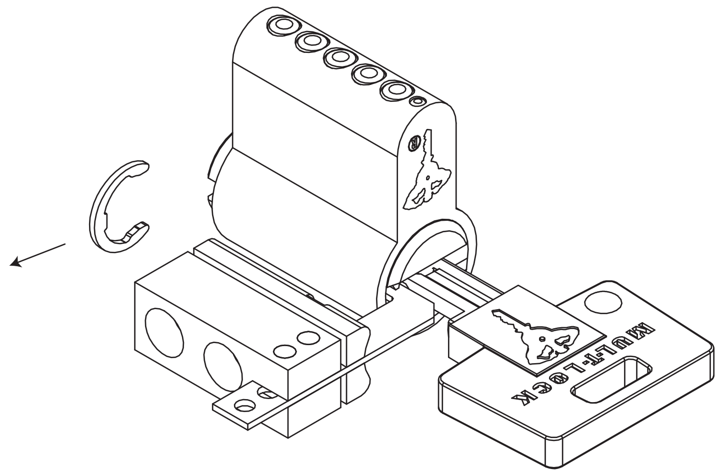
2
Insert the filed key into the cylinder together with the appropriate spring catcher (three types: 19mm, 22mm, and 29mm are provided in the pinning kit).

Push the catcher up to the body of the cylinder.

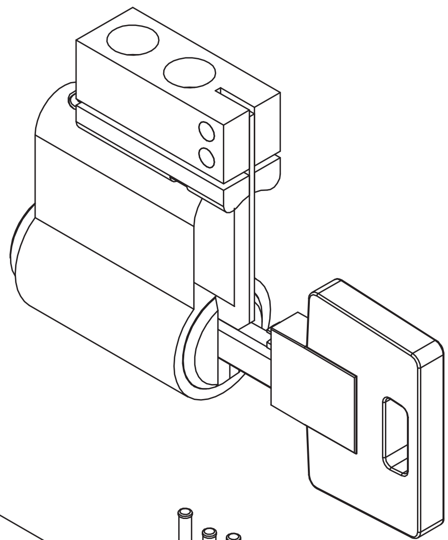


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3
Remove the E-clip, which holds the plug in place.



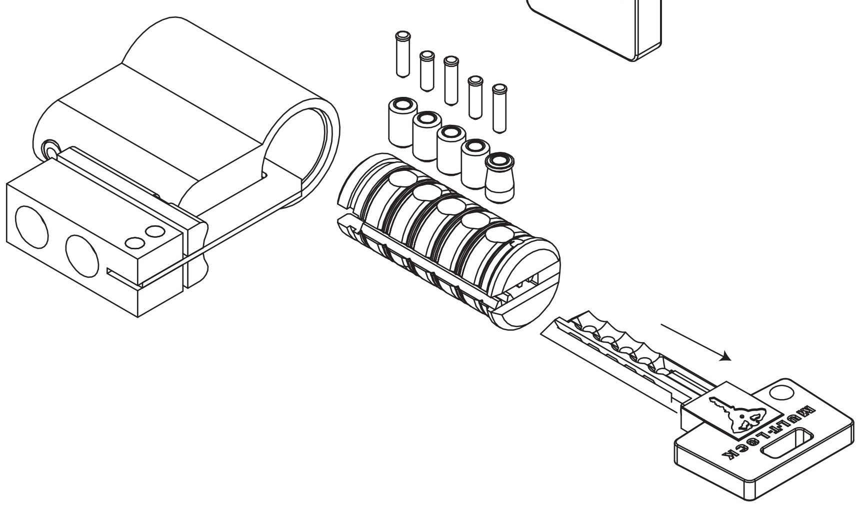
4
Turn the spring catcher clockwise until the catch rests on the body of the cylinder.



5
Remove the plug and the filed key from the cylinder body, making sure that the spring catch is held in place.

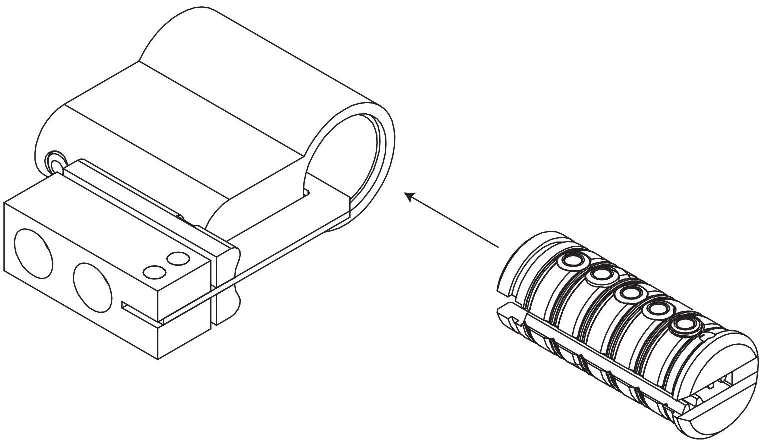
Remove all pins and the filed key from the plug.

Insert the new key into the plug and re-insert the pins to align with the new key, making sure that a proper shear line is obtained.



6
Remove new the key from the plug.

Insert the plug into the cylinder body making sure that the plug reaches all the way to the back end of the cylinder.



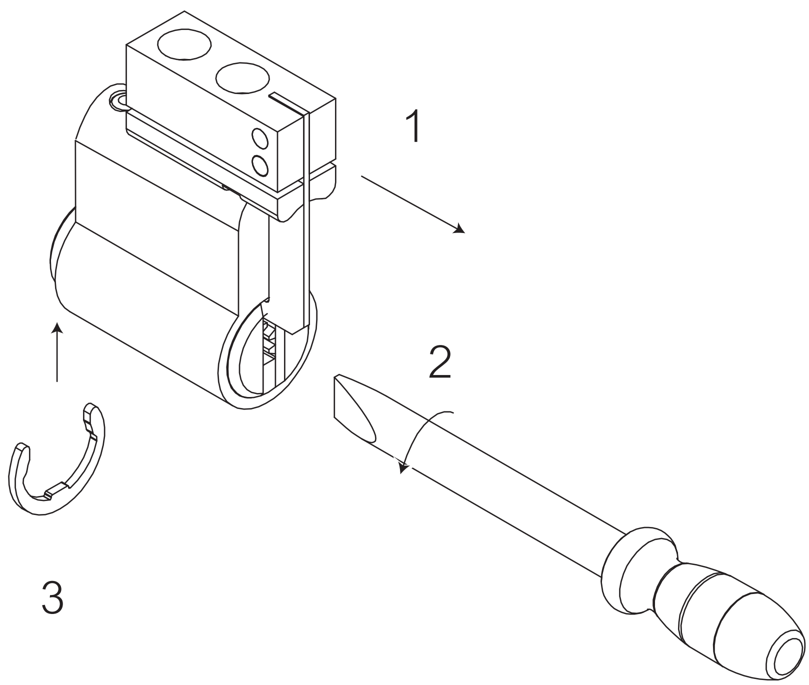
7
Remove the spring catch.

Using a screwdriver or a key tip, turn the plug clockwise until the cylinder pins pop into place.

Make sure that the cylinder operates properly with the new key.

Reassemble the E-clip.

.



Single Cylinder Using a Follower

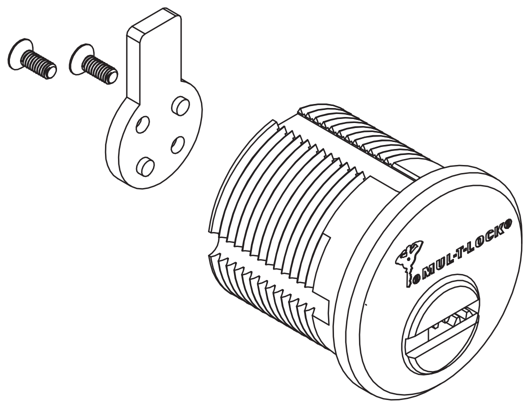
In this example we are using a mortise cylinder. This method is good for any kind of single cylinder.

1

Disassemble the two screws mounted on the back end of the cylinder. Remove the cam.

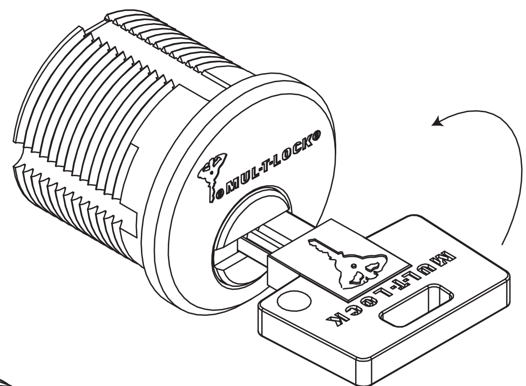
Different types of cams, or a tail for a rim cylinder, may be fitted to the cylinder.

Pay attention to the spacer in the longer cylinders.



2

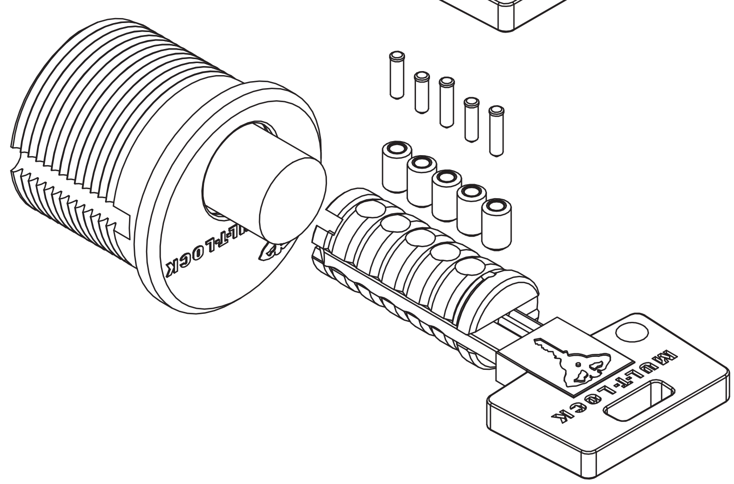
Using the operating key, turn the plug 180° (for cylinders with back pins, turn the plug only 25°!!).



3

Using the follower, push the plug out.

Rekey the plug, making sure that a proper shear line is obtained.



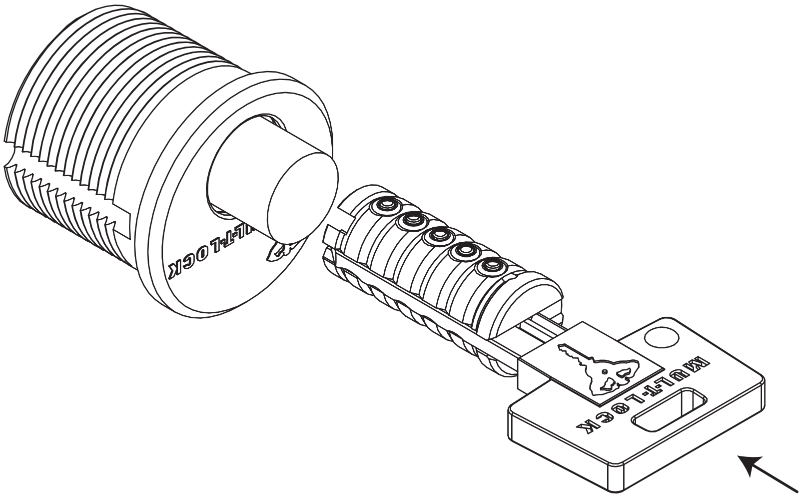
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4

Push the plug into the cylinder body, making certain that the plug is touching the follower and reaches the back end of the cylinder.

Using the key, turn the plug until it is fixed in the proper position.

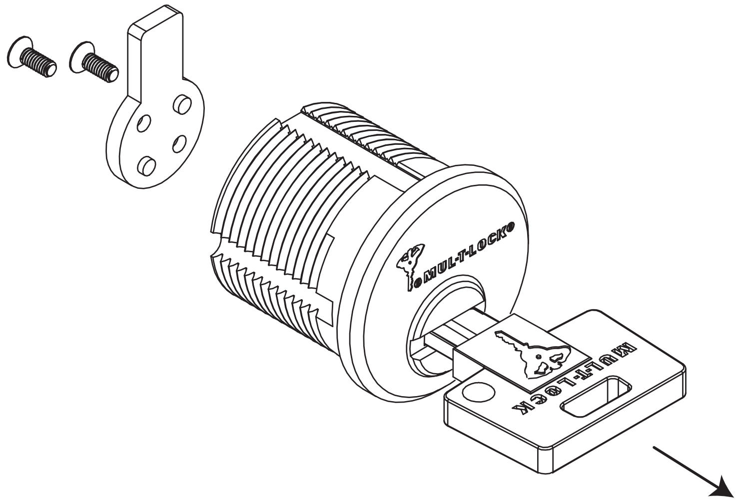


5

Remove the key while holding the plug in place with your thumb.

Reassemble the spacer, cam (or tail piece), as relevant.

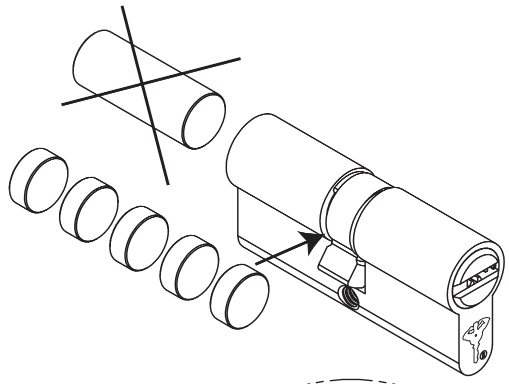
NOTE: Secure cam screws using "lock tight".



Double Cylinder Using a Sliced Follower

1
Since a regular "one piece follower" cannot be used to disassemble a double Sided cylinder.

The answer is to use a filed key or a sliced follower.



1

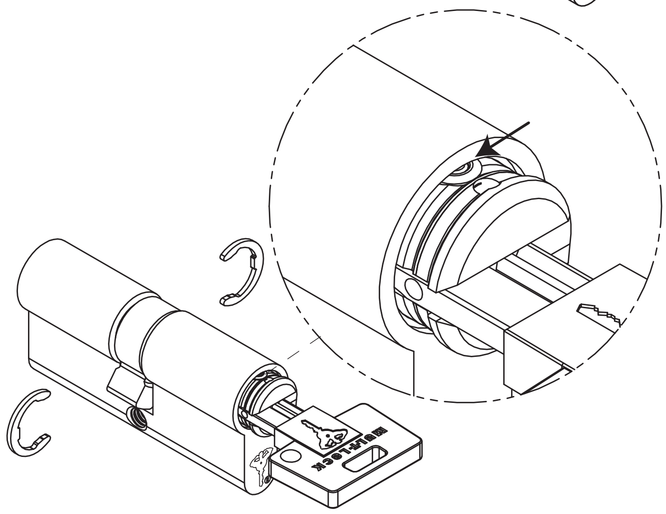
2
Two operating keys are needed!

Remove Both E-clips.

NOTE: When the E-clips are out, pulling the key must be done whilst holding the plug; otherwise the plug will come out with the key.

Insert key from one side and rotate 180° (for cylinders with back pins, rotate only 25°).

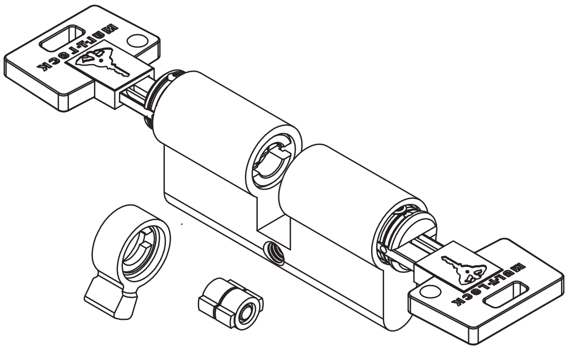
Pull plug out carefully until the first chamber is seen.



2

3
Do the same for other side, and then take out the cam along with the coupling.

NOTE: The coupling is the key stopper. After its removal, you must find the right key position inside the plug to obtain a shear line.

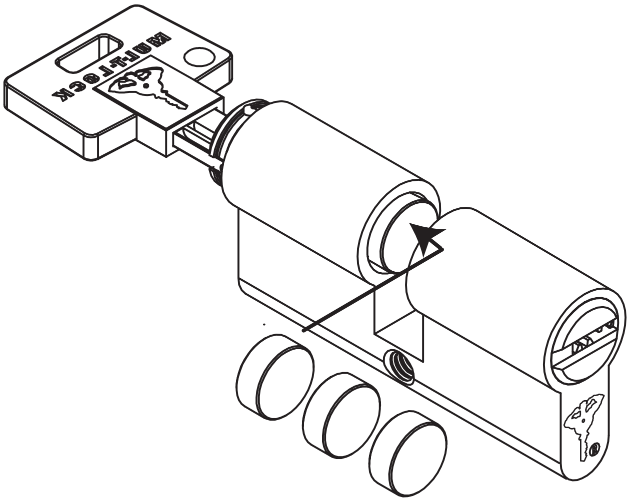


3

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4
Re-insert the plug in one side into place and remove the key.

Remove one of the plug by pushing the sliced follower one slice at a time.

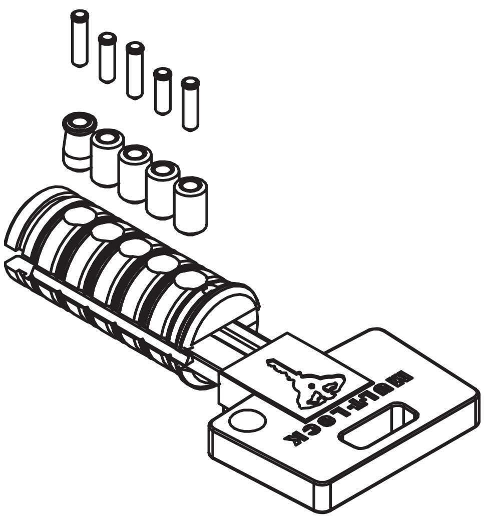


5
Remove the pins and the key from the plug.

Insert the new key into the plug and re-pin the plug with appropriate internal and external pins, making sure that a proper shear line is obtained.

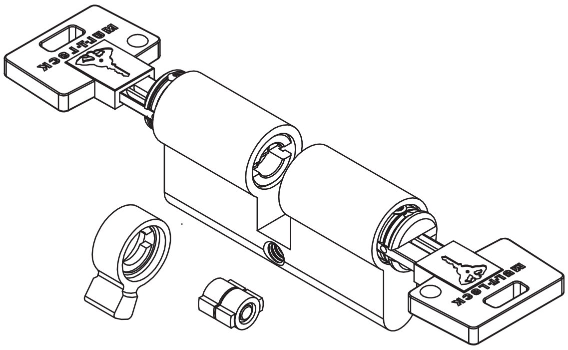
Insert the plug into the cylinder body making sure that the plug reaches all the way to the back end of the cylinder.

Repeat steps 4 and 5 for the other side.



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6
Return to the position as in step 3 by inserting the coupling and cam.

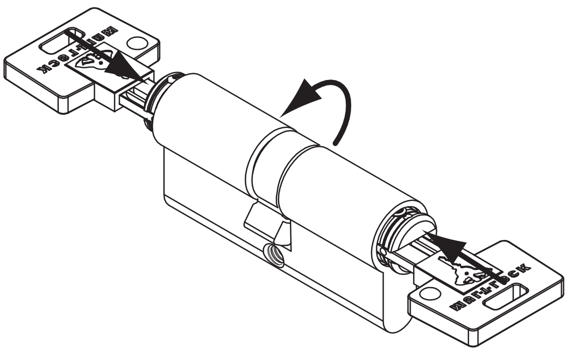


7
Rotate the cam while applying pressure on both plugs as described in diagram 7.

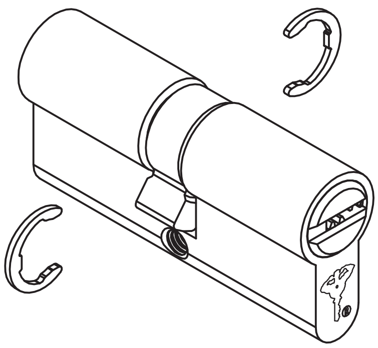
When one plug snaps into place, rotate the key to zero position and take it out.

When removing the key, apply pressure on the plug to prevent it from coming out. Repeat the same for other side.

DO NOT ROTATE KEYS OR PLUGS BEFORE THE PLUGS ARE FULLY INSERTED!!!



8
Reassemble the E-clips.



3 IN 1

Concept, Service & Pinning Instructions

1

1

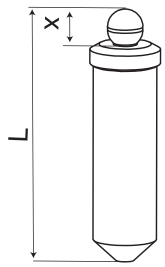
The 3 IN 1 cylinder has been designed by Mul-T-Lock® to allow users to easily change their own key combinations.

It's a simple and speedy process: the user inserts and operates the next key in a sequence of three keys and the introduction of each new key invalidates the previous key.

The product is packaged with three key types, colour-coded Green, Yellow and Red. The combination change is possible due to an internal pin with the special structure .

The ball length is two steps and the combination change occurs when the ball part of the pin is sheered off the pin.

X=1mm (2 steps)
Available pins:
5-3
4-2
3-1
2-0

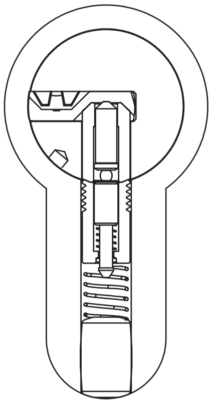


2

2

When a Green key is used in the cylinder.

The special internal pin is above the special pin.

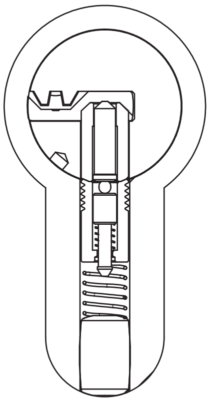


3

3

When a yellow key is inserted into the cylinder.

The ball part of the special internal pin is below The shear line.

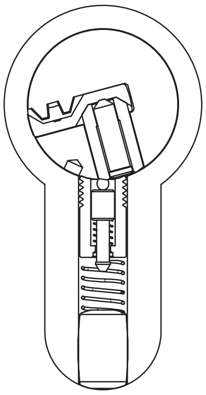


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4

4
When a yellow key is in the cylinder and beginning to turn in the first time.

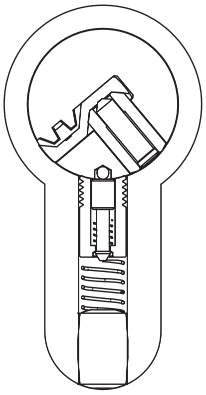
The pin rotates with the plug, while the ball is cut off and stays in the cylinder body.



5

5
When a yellow key is in the cylinder, Continue to turn and complete the first time.

The ball is pushed into a special hole in the plug.

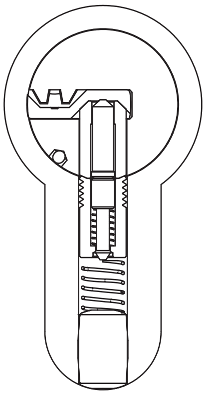


6

6
Cylinder with a Yellow key in regular operation.

The ball is inserted into the special hole in the 3 IN 1 plug.

Every change is done in a different chamber, so the process that is described above will repeat in another chamber for the change from Yellow key to Red key.



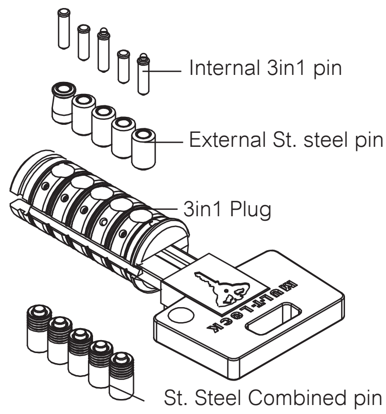
The special parts in the 3 IN 1 cylinder are:

- Plug with special holes for the ball
- Two 3 IN 1 internal plug pins.

In the same chamber Mul-T-Lock® oblige to put external plug pin and combined pin from steel for increased security.

Mul-T-Lock® allows only two changes per cylinder, total of three key changes. Bear in mind that the cylinder can be renewed simply by dismantling it, inserting new internal pins and removing the cut off balls.

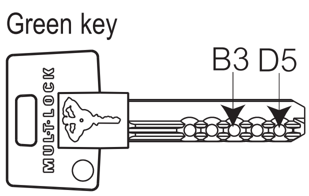
NOTE: There is no option to add master disks to chambers with the 3 IN 1 internal pin.



Examples for the three keys

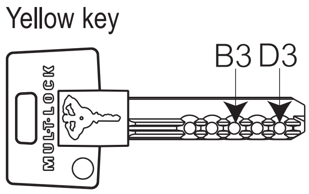
The Green key will have the deepest cuts and is the first key used in the cylinder.

Green key: A1 D5 B3 A1 D5



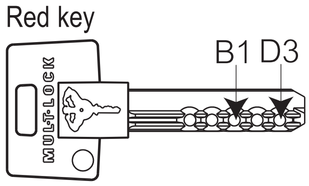
The Yellow key will have one inner pin cut, two steps Shallower than the Green key. It is the second key to be used.

Yellow key: A1 D5 B3 A1 D3

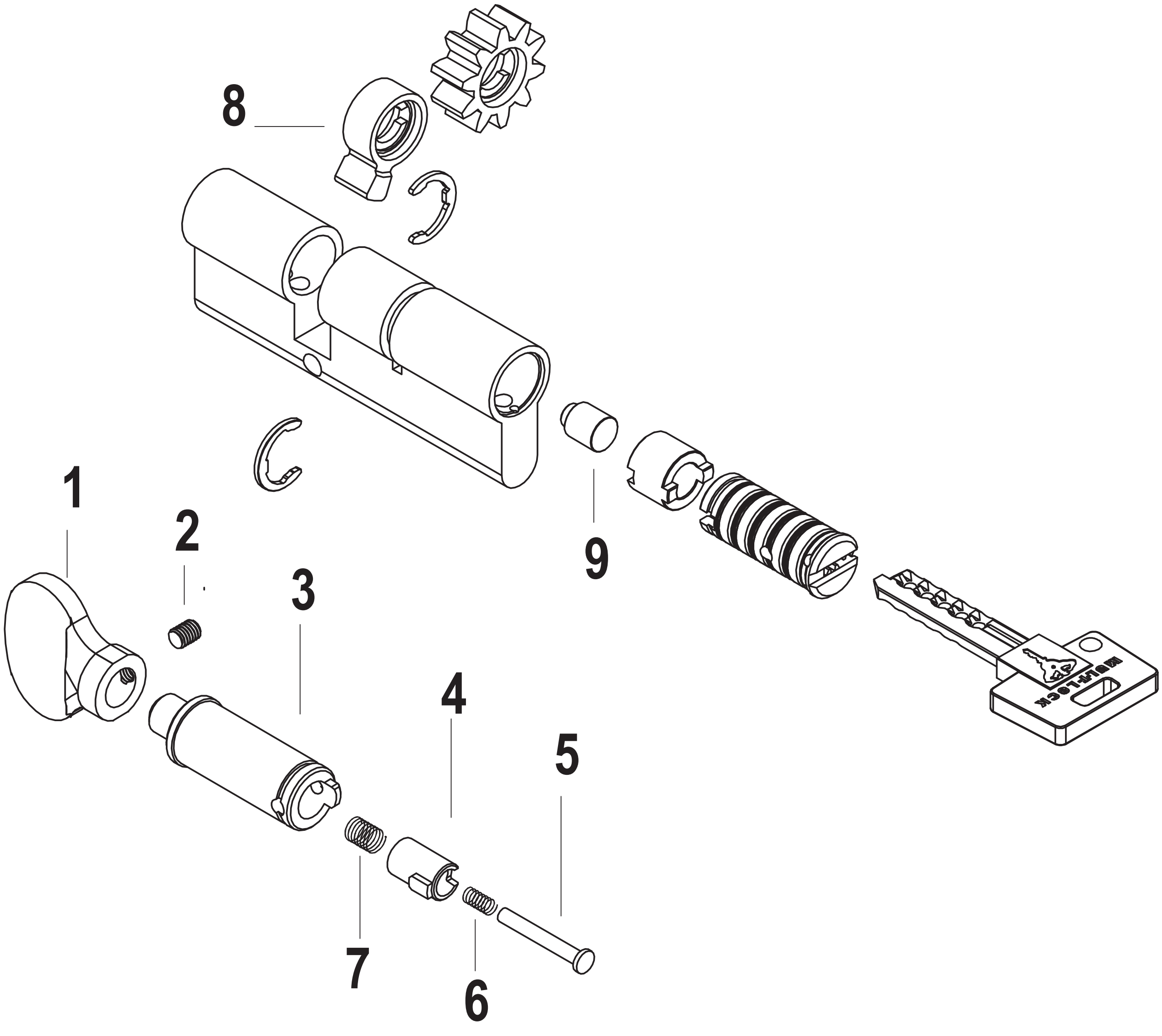


The Red key will have two inner pin cuts, two steps Shallower than the Green key.

Red key: A1 D5 B1 A1 D5

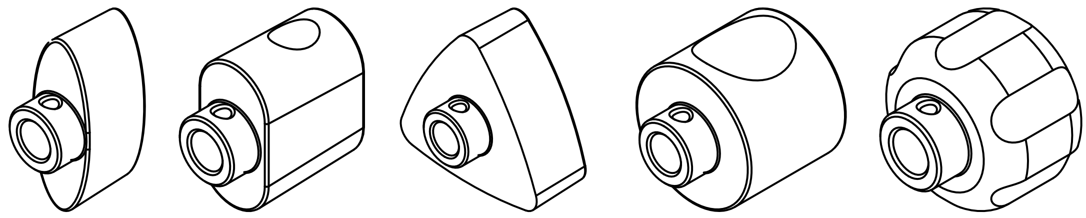


Thumbturn Cylinder
Exploded View



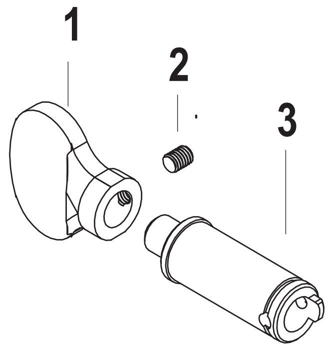
No.	Part	No.	Part	No.	Part
1	Thumbturn	4	Activator	7	Spring
2	Screw	5	Key Stopper	8	Cam/Coghwheel for Thumbturn
3	Thumbturn Plug	6	Activator spring	9	Plug Spacer

Assembly Instructions

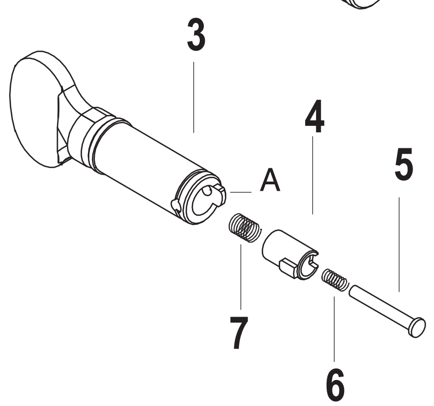


Mul-T-Lock® offers a variety of knobs to accommodate different needs or tastes.

1
Replacing a knob is just a matter of unscrewing one retaining allen screw (2) .



2
Insert parts (4,5,6,7) into the plug (3) .



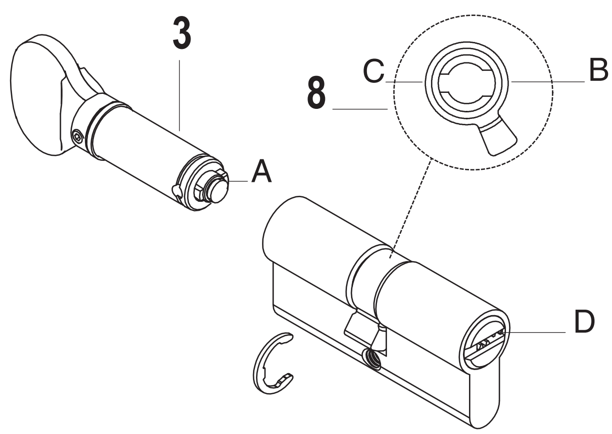
3
Position the cam with the wide opening (B) in Same side as the keyway (D).

Insert the thumbturn plug all the way into the body.

The thumbturn plug tip (A) should go into the wide side of the cam (B) as shown.

Check that the mechanism is integrated and working properly with and without the key!

Hold the plug pushed toward the body until you fix it into place with the E-clip, otherwise it will pop out due to the springs pressure.



Note:
- Cam or cogwheel must be suitable for thumbturn.
- There are no modular plugs for the thumbturn.
- During the assembly of the key side pay attention to the plug spacer (9 in exploded view) it must be with narrow side toward the cam.

Modular Plug

The main idea behind the concept was to assist your logistics. It uses several standard plugs together with spacers in order to fit all cylinder sides that are 40mm and longer.

Cylinders with sides shorter than 40mm are still produced with unique plug lengths.

Cylinders with sides longer than 40mm are produced with standard 32.5mm plugs, together with one or two spacers to complete the cylinder length.

Naturally, there are different standard plugs for different key ways: Interactive® or 3 IN 1 etc.

This new concept was tested to our full satisfaction.

The Unified Plug System will help you to reduce inventories of plugs by keeping in stocks only the standard plugs and spacers. Another major benefit is flexibility and availability of products.

Example:
For a cylinder side of 60mm, instead of using a 59.5mm plug we can now use one standard 32.5mm plug + one 27mm spacer = 59.5mm

Standard unified 32.5mm plug + spacers														
Existing Plug length	Length of Spacer	Spacers - Outer												
		7mm	10mm	12mm	15mm	17mm	20mm	22mm	25mm	27mm	30mm	32mm	35mm	37mm
32.5														
34	1.5													
34.5	2													
37.5	5													
39.5	7	1												
42.5	10		1											
44.5	12			1										
47.5	15				1									
49.5	17					1								
52.5	20						1							
54.5	22							1						
57.5	25								1					
59.5	27									1				
62.5	30										1			
64.5	32											1		
67.5	35												1	
69.5	37													1

Note:
For plugs 32.5mm, 34mm, 34.5mm and 37.5mm, nothing has changed - you will use standard plugs.

For larger plugs, you will need to use a 32.5mm plug + one or two spacers.
Example: for a cylinder side of 42.5mm you will use one 32.5mm plug + one 10 mm spacer.

Modular Cylinder

"One Kit, Endless Possibilities"

The Mul-T-Lock® Modular cylinder provides you with the ability to build a cylinder to a desired length.

Modular Cylinder kits are available in two box configurations, based on “half cylinder” lengths of "35" or "31/33".

A wide assortment of parts will allow you to build any “side” from between 31mm and 80mm. You can build cylinders such as 31x31, 33x78 or 35x40, or any other unique length.

Assembly is as easy as 1-2-3. Just decide the length you need, pick up the right parts and assemble them together.

Table 1 (overleaf) is a reference list that lists the parts required to build the cylinder side length that you need.

The cylinder is built over a center bar. The bar has two sides; each side is identified with a number that indicates the length group that it belongs to.

A bar for a double side cylinder is named “x,x” (two digit number) and a bar for a single side cylinder is named “x” (one digit number).

For example, if you want a 31x46 cylinder you will need:

- One bar type 1,2 (side 1 for the 31mm, and side 2 for the 46mm) and a bar adaptor.
- For the 31mm side, you will need body type 31, Plug 31... and nothing else!
- For the 46mm side, you will need body type 31, Plug 31, 15mm body spacer, 15mm plug spacer and 15mm plug adaptor.
- Four threaded pins.

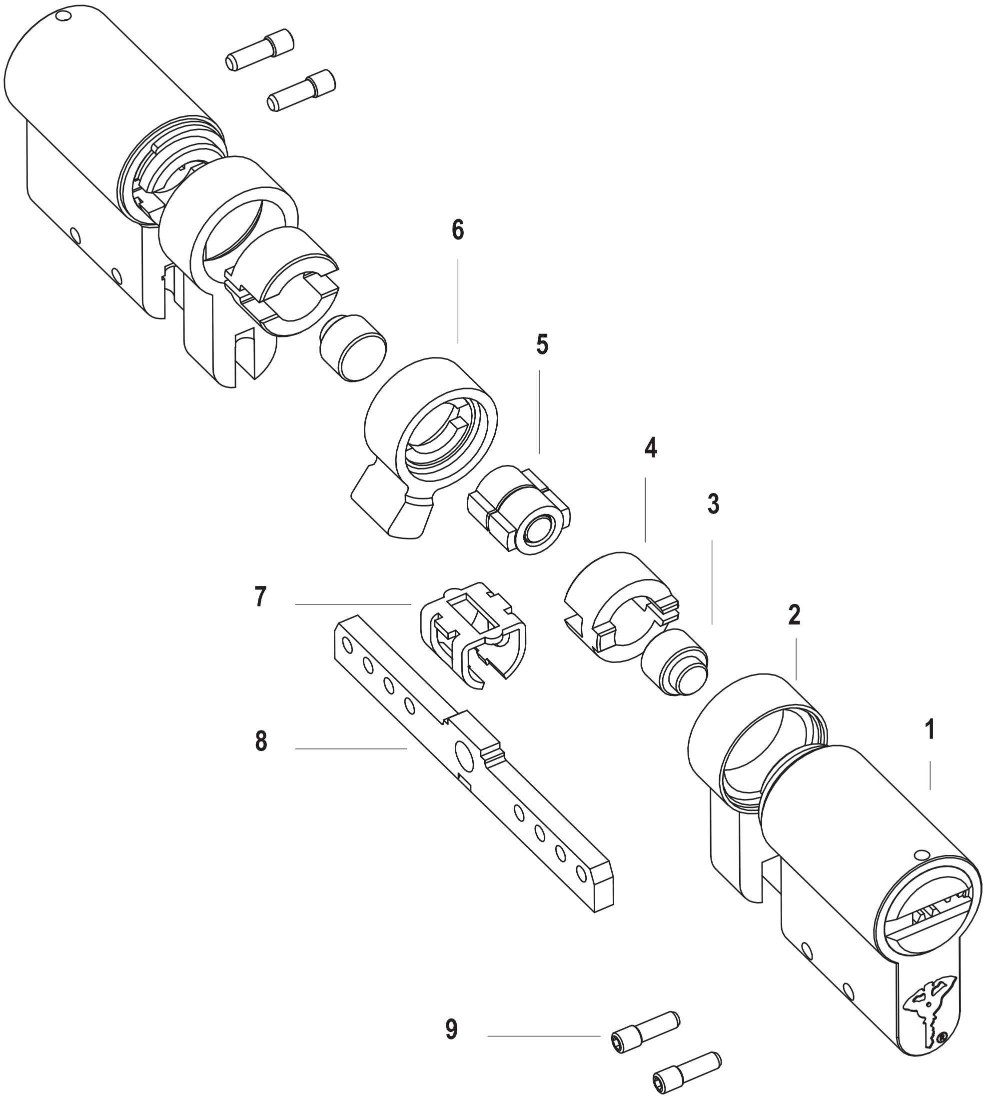
Note:

Bodies and plugs should be ordered separately according to the profile (key way) that you use, and to the reference table.

In order to replenish the contents of your box, you should use special catalogue numbers.

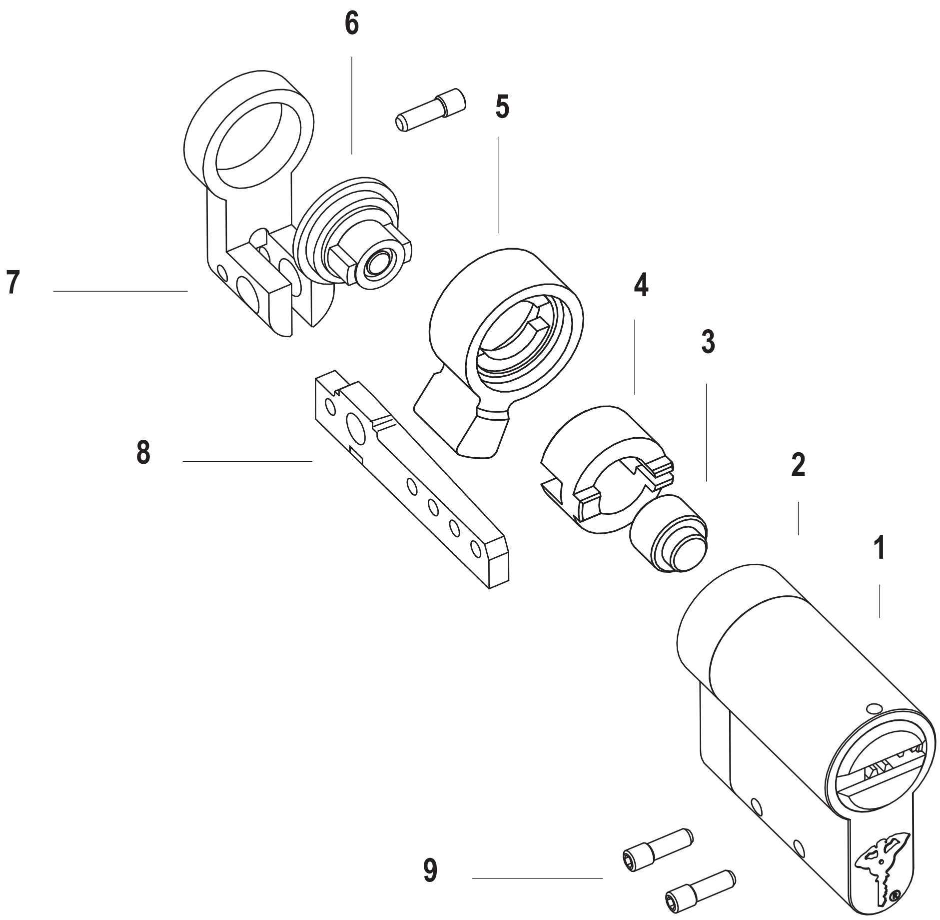
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Double Cylinder Exploded View



No.	Part	No.	Part	No.	Part
1	Modular Cylinder 31/33/35	4	Plug Adaptor	7	Bar Adaptor
2	Body Spacer	5	Coupling	8	Bar
3	Plug Spacer	6	Cam/Gear	9	Threaded Pin

Single Cylinder Exploded View



No.	Part	No.	Part	No.	Part
1	Modular Cylinder 31/33/35	4	Plug Adaptor	7	Adaptor for Single Cylinder
2	Body Spacer	5	Cam/Gear	8	Bar for Single Cylinder
3	Plug Spacer	6	Coupling for Single Cylinder	9	Threaded Pin

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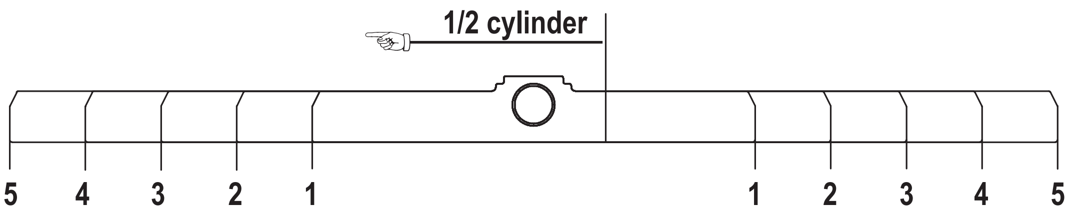
Table 1: Reference List

31/33 BOX

Cylinder Side	Bar	Body	Plug	Body Spacer	Plug Spacer	Plug Adaptor
31	1	31	31.0	0	0	0
33	1	33	32.5	0	0	0
35	1	35	34.5	2	2	0
38	1	33	37.5	5	5	0
41	2	31	31.0	10	10	10
43	2	33	32.5	10	10	10
46	2	31	31.0	15	15	15
48	2	33	32.5	15	15	15
51	3	31	31.0	20	20	20
53	3	33	32.5	20	20	20
56	3	31	31.0	25	25	25
58	3	33	32.5	25	25	25
61	4	31	31.0	30	30	30
63	4	33	32.5	30	30	30
66	4	31	31.0	35	35	35
68	4	33	32.5	35	35	35
71	5	31	31.0	40	40	40
73	5	33	32.5	40	40	40
76	5	31	31.0	45	45	45
78	5	33	32.5	45	45	45

35 BOX

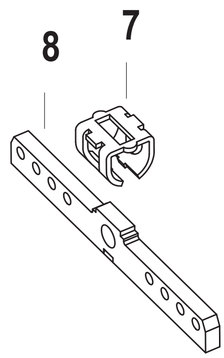
Cylinder Side	Bar	Body	Plug	Body Spacer	Plug Spacer	Plug Adaptor
31	1	31	31.0	0	0	0
33	1	33	32.5	0	0	0
35	1	35	34.5	2	2	0
40	1	35	32.5	7	7	7
45	2	35	32.5	12	12	12
50	2	35	32.5	17	17	17
55	3	35	32.5	22	22	22
60	3	35	32.5	27	27	27
65	4	35	32.5	32	32	32
70	4	35	32.5	37	37	37
75	5	35	32.5	42	42	42
80	5	35	32.5	47	47	47



Assembly Instructions

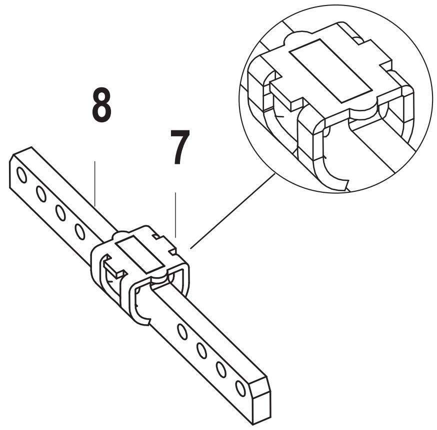
1
Mount the bar adaptor (**7**) on the bar (**8**).

Be careful not to over-spread the bar adaptor.



1

2
Make sure that the bar adaptor fits correctly.



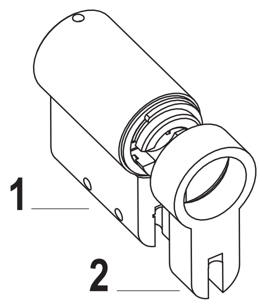
2

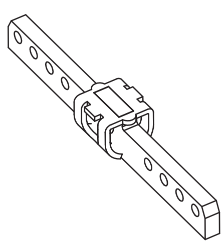
3
If needed, mount the required body spacer (**2**) onto the cylinder (**1**).

NOTE: At this stage, the cylinder should already be keyed to the desired combination.

Slide parts together on the correct bar side until the holes in the body of the cylinder are aligned with holes in the bar.

NOTE: It is recommended to start with the longer side first.





3

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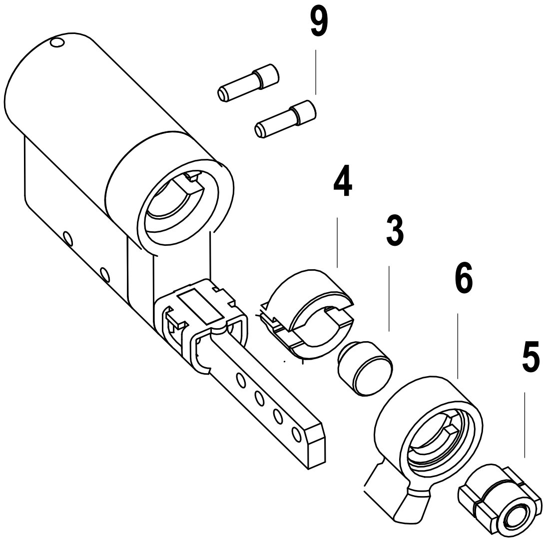
4

4

Screw two threaded pins (9) with 1.5 Allen wrench (provided in the kit). Do not tighten them all the way.

Slide in the plug spacers and adaptor (3, 4) (if needed), cam (6) and coupling (5).

NOTE: threaded pins can only fit one side.



5

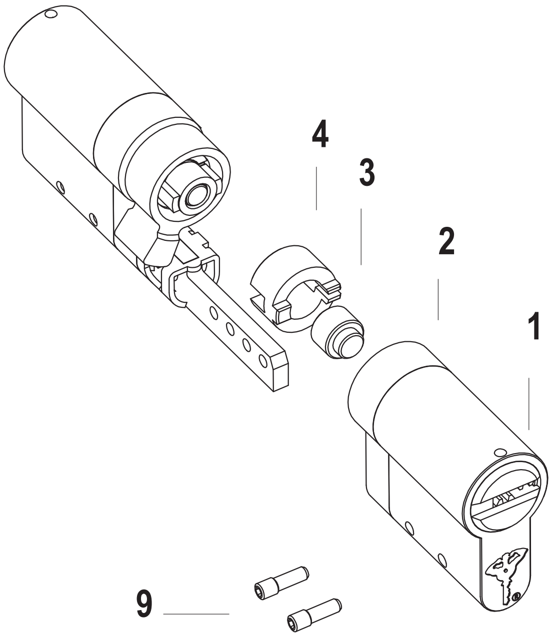
5

Mount the required body spacer (2) onto the cylinder (1).

Insert plug spacers and adaptor (3, 4).

Slide them all on the other side of the bar.

Insert threaded pin, confirm that the cylinder is straight and tighten all the threaded pins.



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Table 2: Catalogue Numbers for Replenishment

#	Catalogue #	Description
1	84400001	Bar 1
2	84400002	Bar 2
3	84400003	Bar 3
4	84400004	Bar 4
5	84400005	Bar 5
6	84400008	Threaded Pin
7	84400010	Bar Adaptor
8	84400011	Bar 1,1
9	84400012	Bar 1,2
10	84400013	Bar 1,3
11	84400014	Bar 1,4
12	84400015	Bar 1,5
13	84400019	Bar 2,2
14	84400020	Bar 2,3
15	84400021	Bar 2,4
16	84400022	Bar 2,5
17	84400023	Bar 3,3
18	84400024	Bar 3,4
19	84400025	Bar 4,4
20	80000322	Plug Spacer 2 mm
21	88000018	Plug Spacer 5 mm
22	88000025	Plug Spacer 7 mm
23	88000019	Plug Spacer 10 mm
24	88000012	Plug Spacer 12 mm
25	88000020	Plug Spacer 15 mm
26	88000017	Plug Spacer 17 mm
27	88000031	Plug Spacer 20 mm
28	88000026	Plug Spacer 22 mm
29	88000024	Plug Spacer 25 mm
30	88000027	Plug Spacer 27 mm
31	88000028	Plug Spacer 30 mm
32	88000032	Plug Spacer 32 mm
33	88000035	Plug Spacer 35 mm
34	88000037	Plug Spacer 37 mm
35	88000029	Plug Spacer 40 mm
36	88000042	Plug Spacer 42 mm
37	88000045	Plug Spacer 45 mm
38	88000047	Plug Spacer 47 mm
39	81200003	Cam 30°
40	80000019	Coupling
41	84400030	Body Spacer 2 mm
42	84400031	Body Spacer 5 mm
43	84400032	Body Spacer 7 mm
44	84400033	Body Spacer 10 mm
45	84400034	Body Spacer 12 mm
46	84400035	Body Spacer 15 mm
47	84400036	Body Spacer 17 mm
48	84400037	Body Spacer 20 mm
49	84400038	Body Spacer 22 mm
50	84400039	Body Spacer 25 mm
51	84400040	Body Spacer 27 mm
52	84400041	Body Spacer 30 mm
53	84400042	Body Spacer 32 mm
54	84400043	Body Spacer 35 mm
55	84400044	Body Spacer 37 mm
56	84400045	Body Spacer 40 mm
57	84400046	Body Spacer 42 mm
58	84400047	Body Spacer 45 mm
59	84400048	Body Spacer 47 mm
60	80000594	Plug Adapter 7 mm
61	80000595	Plug Adapter 10 mm
62	80000596	Plug Adapter 12 mm
63	80000597	Plug Adapter 15 mm
64	80100600	Plug Adapter 17 mm
65	80100601	Plug Adapter 20 mm
66	80100602	Plug Adapter 22 mm
67	80000598	Plug Adapter 25 mm
68	80100603	Plug Adapter 27 mm
69	80000599	Plug Adapter 30 mm
70	80100604	Plug Adapter 32 mm
71	80100605	Plug Adapter 35 mm
72	80100606	Plug Adapter 37 mm
73	80100640	Plug Adapter 40 mm
74	80100607	Plug Adapter 42 mm
75	80100645	Plug Adapter 45 mm
76	80100608	Plug Adapter 47 mm
77	84400057	Allen Key 1.5 mm
78	82600260	Emergency Cam
79	87602150	STD Cover 5 pin
80	84600011	Single CYL. Coupling
81	84400029	Single CYL. Adaptor

Box Layout

Box layout for 31/33 products

<table>
<tr><td colspan="2">1-5, 10, 13</td><td colspan="4">11, 12, 14, 15
16, 17, 18, 19</td><td colspan="2" rowspan="2">77</td></tr>
<tr><td>42</td><td>21</td><td>Extra</td><td>Extra</td><td colspan="2">8, 9</td></tr>
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</table>

Box layout for 35 products

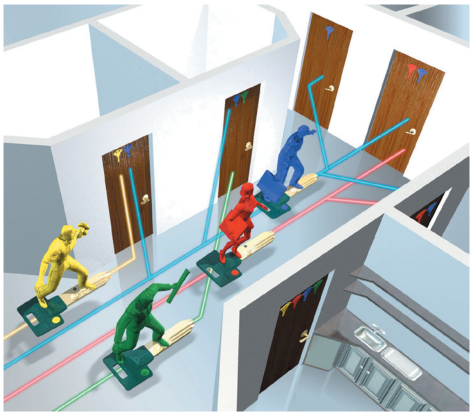
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10, 13</td></tr>
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<tr><td>81</td><td>80</td><td>79</td><td>78</td><td>39</td><td>40</td><td>6</td><td>7</td></tr>
</table>

Introduction to Master Keying

The section below provides an overview of the Mul-T-Lock® master keying process, and is intended to serve as a guide and reference for those who have received training in master keying. It has been designed to assist you in organizing and implementing a better master key system to meet your customer's specific needs.

There is no one right solution for a master system. For any "customer request" there will be a couple of dozen solutions that will work, but only few will be optimal and professional.

Master systems are a living and dynamic business... they don't end when you make the sale and installation. There will be ongoing work in cutting keys, expanding the system and maintenance. It's a long lasting business relations.
A well-designed and professionally implemented system will not only make you proud, but provide a constant flow of income for years to come.
On the other hand, poorly designed and unprofessional implementation can damage the company name and cause a flow of "free service calls!"
This is the reason that master keying is for the professional locksmith.
Mul-T-Lock® consider it vitally important that our systems are professionally designed and installed. And to help you to make that happen, we provide professional back-up and support... all the way from the initial design to the final installation.
Contact your local distributor if you have any questions regarding master keying.



Design Methods

Hierarchical presentation of a master key system

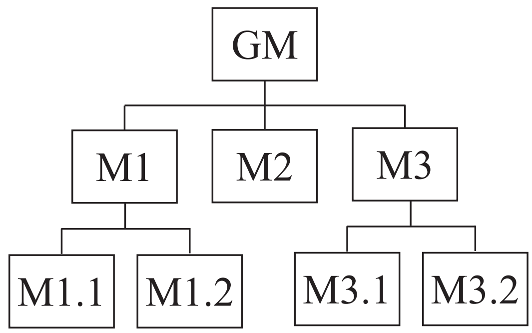
A common names for a hierarchical structure is a "tree" or "flow chart".

In the Hierarchical presentation every node represents a key and cylinder. This presentation has a rigid structure that won't allow flexibility in design in the present although with a good initial design it is easy to expend in the future.
This type of design support entrance doors.

The logic of this presentation is:

Several levels of access authorization; higher levels are authorized to open only related lower levels (E.g. M1 open M1.1 but can't open M3.1)

There is no access authorization in the same level (E.g. door M2 will not open by key M1) The highest level is related to the Grand Master key (GM) which can open every Cylinders in the system, Lowest levels are related to keys that may open only a single cylinder.



A schematic of a Hierarchical key system

We use A common way to mark the hierarchy every dot represent getting down one level (E.g. M1 is the first level beneath the GM, M1.1 is in the second level beneath the GM).

Matrix representation of a master key system

This structure allows very flexible design and support cross keying.
But once you installed the system changes may involved rekeying of installed cylinders. It is recommended that All expansion be included in the initial design.

Using a Matrix chart, Each column represents a Cylinder and each row represents a Key.
Every x marks an opening the cylinders that each key is allowed to open.
(E.g. key K4 open cylinder C1 and open C4)

	C1	C2	C3	C4	C5
K1	X	X	X	X	X
K2	X	X			
K3	X		X		
K4	X			X	
K5	X				X

A schematic of a Matrix key system

Comparison between “Tree” and "Matrix"

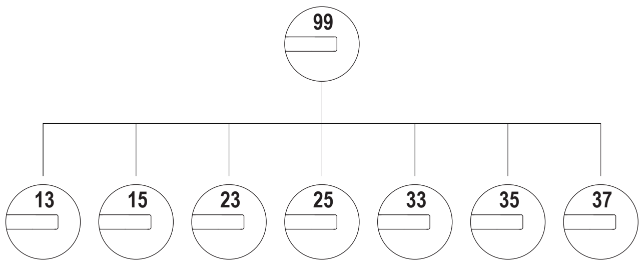
First let start in the end it is Usually its better to work with tree if possible.

	"TREE”	"MATRIX"
Future Expansion	Possible to expend the system in relatively flexible way if you leave options in the initial design	You must insert into the initial design the exact expansion, there is no easy way of expending an existing M.K.S
Cross keying	Limited to common entrance doors	Support cross keying.
Amount of Master Disks	Usually one layer of master Disks. (Except entrance doors)	In Matrix with cross keying there are cylinders loaded with master Disks stacking

Design options profiles & keys

LH keyways for Master Keying

In addition to our extensive master capability MUL-T-LOCK® offers hierarchical structure of keyways (multiplex key system).
The multiplex system consists of Master key way 99 and seven sub-keyways.



Using double sided key

Double-sided key in master key system may be use to enable greater system manipulation and flexibility. By cutting each side of the key differently each side can become a different key.
To distinguish one side from another, there is coloured nylon insert in one side.

One way of using Double-sided key is to create GM for M.K.S with two combination it can be only two cylinders (E.g. home and office)
Or big systems of keyed alike.
These systems do not use Master disks and are therefore more secure and more durable.
They may be produced using keys and cylinders from stock.

Central M.K.S using double sided keys in two ways:

First as double sided GM for two different M.K.S on one key.
This option allow us creating bigger M.K.S, bear in mind that we have to make sure that cylinder in one side won't be open accidentally by the other.

The other option is highly recommended by us:
Use one side for the M.K.S and the other for entrance door with uncut cylinder.
Entrance doors have problematic cylinder they are weak point in any M.K.S.
(There are a lot of users to an entrance door) so we get a cylinder with a lot of master pin in couple of layers that make the cylinder to be more vulnerable than other cylinders.
The same cylinder works a lot harder then any other cylinder in the system. (Every body is going in and out using this door). The usage of a double-sided key for entrance door allows to use a none "M.K.S cylinder". The result -significant improvement in the life spans of the cylinder.

Work Flow of Master Key System

Gathering information

A site survey first step is to obtain the full list of cylinder to be incorporated in this M.K.S , their type and Complementary hardware.
The better way to do it is by the locksmith who's going to install the M.K.S
A list from the customer can be helpful-but better do it yourself.
One good reason for it is to give him understanding of the nurture of the place and system but the most important one is to prevent mistakes in the type of cylinders or all kind of forgotten doors and cylinder.
Don't forget that there are other cylinders except doors like padlocks, cabinets locks…
In the end of the day you should have in your list for each cylinder
Number of side & back pins available, length and number of chambers, profile, and driver type (standard or 22).

Construction blue print it is recommended to obtain them.

(See suggested sample form for site survey - page C.410 V1).

Guide lines

Always try to avoid cross keying, tree is preferable then matrix.

Try to leave as many constant chambers as possible but not less then one!

When top master keys are stolen or lost ,the security of the M.K.S is breached.
The only solution is rekeying the entire system.
Its recommended splitting large M.K.S to couple of smaller ones.
Smaller system are with less master pin, safer and will reduce the damage in the event of thy above.

People change much often then function or job title's so its better to name keys and cylinder as jobs and function then people names (e.g. R& D manager and not MR. Smith maybe MR. Smith is " no longer working here").

The cylinder with lowest M.K capability is the top barrier for master keying.
(E.g. if you have Cylinder with 3 chambers and 2 side pins you can use only 3 Chambers and 2 side pin for master of the entire master key system).

Progression sequence in cutting chambers is:
First the middle ones then the one close to the tip of the key last option is the chamber nearest to the key head. Interactive chamber- can't be count into this.

Because of the sensitivity of master cylinder (multiple shear lines) we differ master cylinder from regular cylinder in such way that regular key wont to be able even to enter the system the regular cylinders are in right profiles so we keep the left profiles for master keying. In addition we strongly recommend using side pins as added security

System Characterization

This stage is very important and will determine the design will be in a tree or matrix
The locksmith role here is to advise and guide the client to characterize the best and safest M.K.S that suit his need.

Determine authorization definition of what keys will open which locks.

Future developments this subject must be discussed with the client and together decide the future expansion of the system. Always try to go to the maximum possible Capability without Overloading the system with master pins for cylinders that will never be installed. Don't forget we are not talking about expansion for next year but for all the life span of the system.

What marking will show on cylinder and key.
It's critical for later management of the M.K.S to mark the cylinders and keys.
Be careful not to make it too obvious, don't leave identifying details on the key like company name, maybe one of the keys will be lost or stolen no reason to make an easy life for " bad persons".
Use running numbers or any other non distinguish method.
In a tree our default marking are GM M1 M1.1 and so on.
If you want specific marking make them simple it's not a book.

How many keys will provided with each cylinder.

Packaging & marking on package.

Contact person - who is the contact person you going to work with.

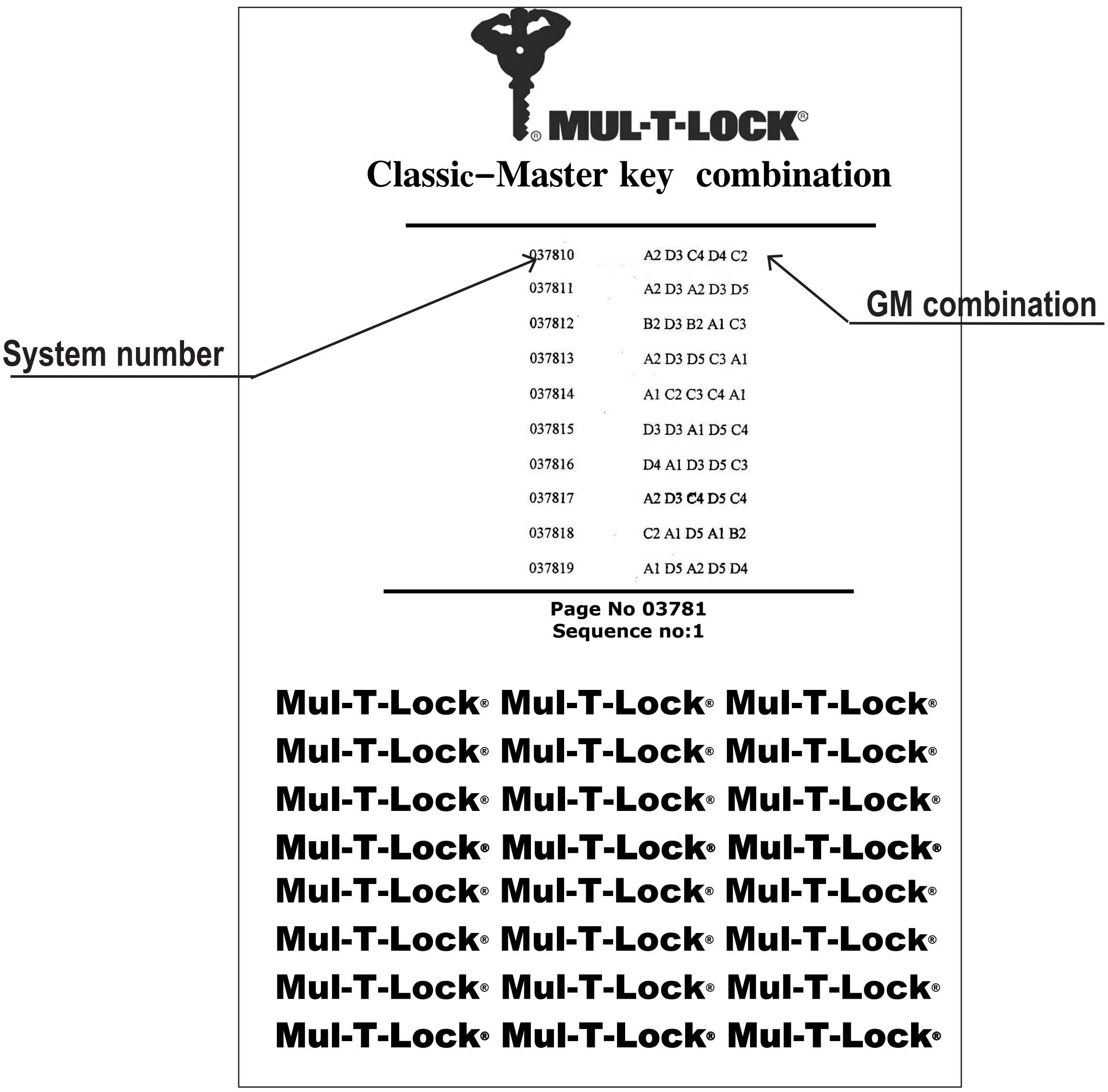
System design

Determine system number & GM combination using GM combination package. The idea is to Prevent Random repetition of GM combination in different M.K.S.
There are different kinds of GM combination package for each profile (classic & Interactive®. all together seven types).

GM combination package contain:

List of 10 different combination each one identified by unique identification number.
Each combination is meant to be used for a production of one unique master key systems. (See sample list) .

10 cards each one stamped with identification number that appear on the above list
This card is given to the end user so that the locksmith may produce extra keys, change combination service the system etc.
We work only with system numbers so its very important to keep it for future dealing with us.



MASTERpiece - MUL-T-lock ® software for M.K.S designer.

Using MASTERpiece the only way we approve to design MUL-T-lock ® M.K.S.!
Trying to do it manually only will cost you time and you might use an unauthorized combination the only approved biting list is embedded inside MASTERPiece.

The MASTERPiece computer program makes the Master Keying process faster, easier and more efficient. It does not preclude knowledge about Master Keying, however, it automatically produces the necessary information for the viewing and production of a Master Keying Systems, either specified as a Hierarchical system (Tree format) or in the Matrix Format.
MASTERpiece in Tree format support progression and rotating constant.
Cross keying can be done only in matrix format.

After gathering all the necessary information about the system & System characterization, use MASTERpiece to build and design the system. MASTERPiece will automatically create the necessary combinations.

In addition to the computerized generation of combinations, the program enables you to:
- Print a lock scheme of the system for approval by the customer
- Print labels with relevant information to mark packaging.
  Keep records of the system, the key holders, and the cylinders / padlocks that were used and how many- were originally requested.
- Full compatibility With Multimanager.

Multimanager

Is a program, which helps to keep track of the keys in a system. Every time, e.g., a tenant is given a key, it is stored in a database and a receipt is printed, which should be signed and stored in an archive. The program keeps tracks of and can display reports about the number of keys in stock, the keys on loan and how many keys that are discarded or lost. It is possible to handle more than one system.
MASTERpiece enables you to export key

Documentation

Add a Written document with detail about the system
Who ordered the M.K.S, what are the restriction, building description, special feature and all the material that will help you understand the reasoning behind the design in 2 or 3 years when you will be asked to expend the M.K.S.

System approval

It's most recommended that the final design including system layout and combination will be sent to the customer to sign approval

Carrying out an order

You can sent us a MASTERpiece file and get the system fully assembled and marked with label on each package .You can order cylinder in service combination rekeying & cutting the keys by your self.
You can order only the key if you sent a MASTERpiece file We can manufacture only the keys. For more details see order information.

Production

Print cylinder and key combination from MASTERpiece,
Assemble the cylinder and cut the keys according to output Mark cylinder & keys as was agreed with the client.
Insert every cylinder in to separate nylon bag with appropriate label (printed with MASTERpiece) Go throw same process for the keys.

System inspection

Check that the cylinders function properly and the keys open every cylinder they supposed to. Check that there are no bad opening (cylinders are opened by keys without authorization)

Record keeping

MASTERpiece Save a file, we recommend to save it by system number.
Make sure that there is beck up file and update them.
Hard copy keep one as well, with all relevant documents.
It is essential to keep track of what actually was installed on the site it will enable you a better control of changes and will protect you from allegation about manipulation that somebody else made in the system.
Security all this data is confidential and sensitive you have to secure it and limit the excess to the hard copy or the computer archive.

Return orders by definition - order of a, b, c products from existing design.

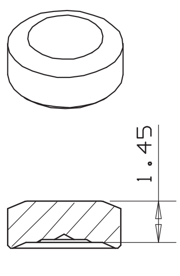
You go beck to production and up date record.

Change in design with regard to the limitation of the existing system its like initial design from the first step.

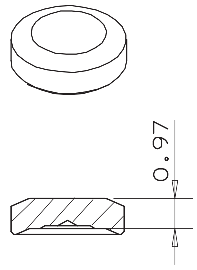
Classic & Interactive® Systems Master Components

Mul-T-Lock® Master Disks

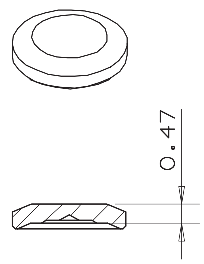
Solid master
disk # 3



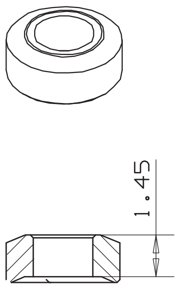
Solid master
disk # 2



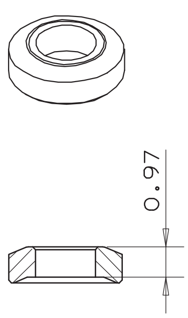
Solid master
disk # 1



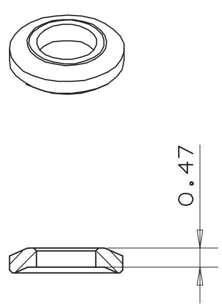
External master
disk # 3



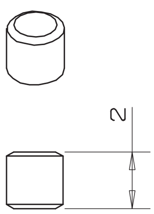
External master
disk # 2



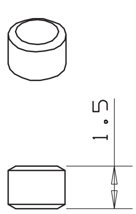
External master
disk # 1



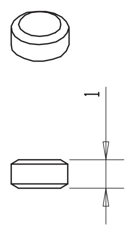
Internal master
disk # 4



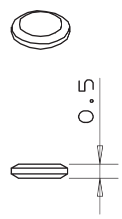
Internal master
disk # 3



Internal master
disk # 2



Internal maste
disk # 1



MUL-T-LOCK®
An ASSA ABLOY Group Company

Solid Plug Pins

Introduction basic construction and terminology

This revolution in master keying concept is only available in telescopic pins tumblers. Trying to explain it in a one short sentence: we took the “multiple sheer line” away from the plug sheer line, and moved it into the key side!

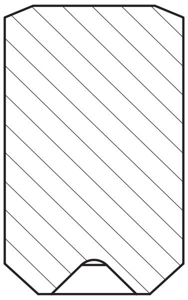
This way increasing the reliability of master keyed cylinder, while the system performance and possibilities goes up!

The core of the approach is “merging” some set’s of telescopic pins, and by doing so we got 15 pins that will be added to the Master keying kits,

Those pins divide into three different categories.

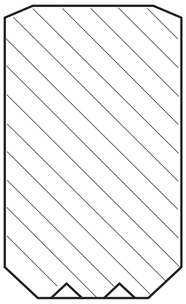
First : pins that will “ride” on the external cut only they will be identified by a letter followed by a (-) sign.

Z-
A-
B-
C-
D-



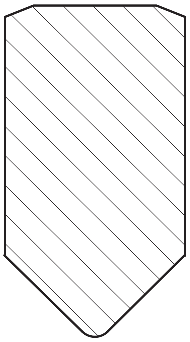
Second: pins that will “ride” on both external and internal, at the same time – or on the shallower of the two. They will be marked by double letter

ZZ
AA
BB
CC
DD

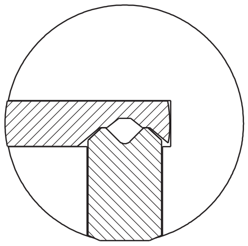


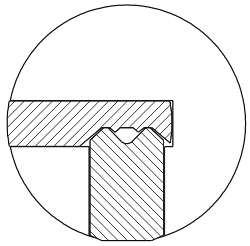
Third : those pins are with a “point” and made to “ride” on the internal cut only – they are identify by a letter followed by a (+) sign.

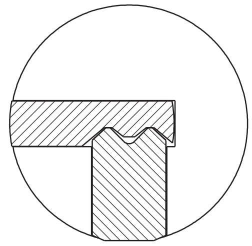
Y+
Z+
A+
B+
C+



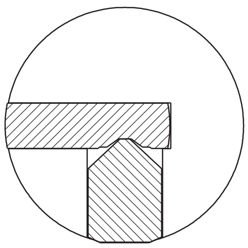
If we would look on a pin "C-" from above example, we can see that a chamber containing this pin will be opened by one of three cuts: C4, C3, C2 and nothing else!

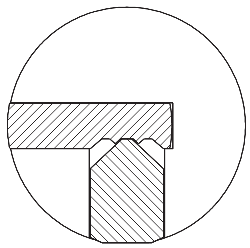

Cylinder: C-
Key: C4

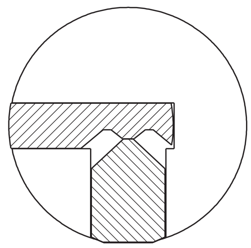

Cylinder: C-
Key: C3


Cylinder: C-
Key:

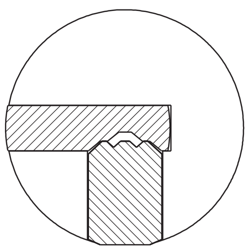
2
And if we would take pin "A+" then the three opening cuts will be: A2, B2, C2, and nothing else.

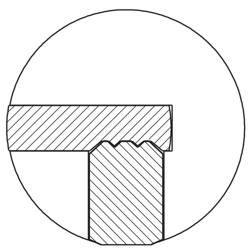

Cylinder: A+
Key: A2

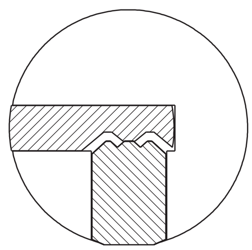

Cylinder: A+
Key: B2

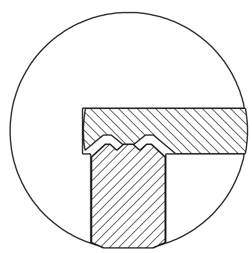

Cylinder: A+
Key: C2

3
If we take a dual letter pin BB from the above we can see that it will work with out any problem with a B3, B2, and C2, but trying to open it with a B1 cut, the shear line will be blocked.


Cylinder: BB
Key: B3


Cylinder: BB
Key: B2


Cylinder: BB
Key: C2


Cylinder: BB
Key: B1

Opening chart for Solid plug pins

#	Chamber Designation (Software report)	Open for keys:													
		Z0	Z1	AO	A1	A2	B1	B2	B3	C2	C3	C4	D3	D4	D5
1	ZZ	X	X	X											
2	AA				X	X	X								
3	BB							X	X	X					
4	CC										X	X	X		
5	DD													X	X
6	Z-	X	X												
7	A-			X	X	X									
8	B-						X	X	X						
9	C-									X	X	X			
10	D-												X	X	X
11	Y+	X		X											
12	Z+		X		X		X								
13	A+					X		X		X					
14	B+								X		X		X		
15	C+											X		X	

Additional combination are available by introducing the solid master disks above the solid plug pins.

Our expectations from this concept:

- Increasing the mechanical reliability of master keyed cylinder, as we will now have fewer parts in every chamber.
- Increasing the security of master key systems as “lockout” of unauthorized keys, is always achieved by an external plug pin!
- Ease of assembly – as parts is bigger then what they used to be.
- Increasing the ability to solve, complex cross keying challenges.

Side/Back Pins

Side/back pins enabling us to deal with bigger and more sophisticated systems and at the same time increase the mechanical reliability of the cylinder.

Here we will introduce the use of side/ back pins.
Any type of cylinder can be specially ordered with plug and body, pre-drilled for side pins (the number of side/back pins can vary according to cylinder type length and profile).
The person who builds the master key system will insert the pins and also cut the corresponding dimples (cuts) on the key edge or back.

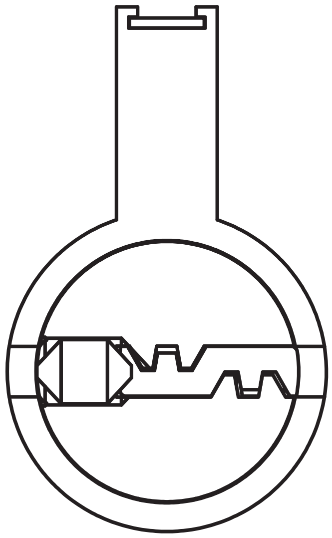


Fig. 1-C370

The principle by which Mul-T-Lock® side/back pins operate is:
A blocking pin insert into drilled hole inside the plug, while inserting the key the side/back pin is activated by the key if the key is missing the right side/ back pin combination the side/back pin will block the plug rotation within the shell, Side/back pin are passive pins.

Cylinder with only side pins mechanism is described in Fig. 1-C370.

Cylinder with side and back pins mechanism is described in Fig. 2-C370.

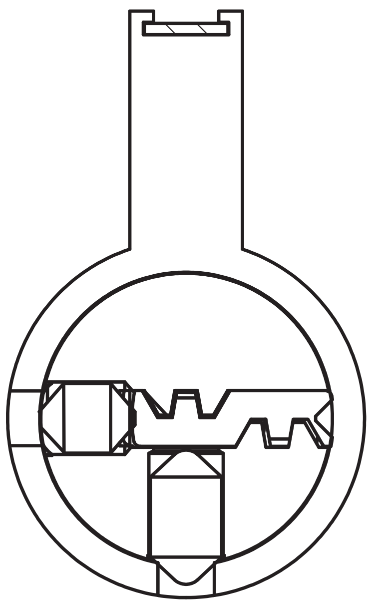


Fig. 2-C370

An ASSA ABLOY Group Company

Hierarchical relationship between side pin combinations

The mathematics behind this is quite simple:
By introducing one or more side/back pins in a cylinder, we can create new differences between cylinders, on top of those already existing from the basic key combination.
In table 1 we describe all the possibilities only for side pins, (total 31).
Notice that:
In 1 through 5, we have used 1 pins / cuts every time.
In 6 through 15, we have used 2 pins / cuts every time.
In 16 through 25, we have used 3 pins / cuts every time.
In 26 through 30, we have used 4 pins / cuts every time.
In set 31, we used all 5 pins / cuts and this can be done once only!
In Fig. 1-C380, you will notice that the outcome of this is a huge scheme of hierarchy and cross keying, that can be put to use in a very helpful way to help us meet master key challenges.
The most effective way is to make use of two pins in a cylinder, which can split a system into 10 different groups.
Using back pins will add greater range of combination.

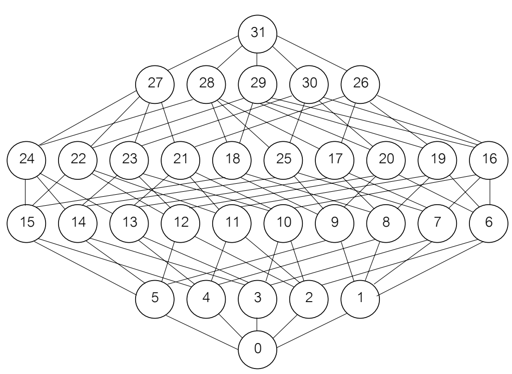
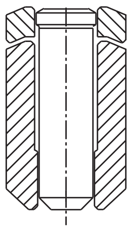


Fig. 1-C380

0					
1	●				
2		●			
3			●		
4				●	
5					●
6	●	●			
7	●		●		
8	●			●	
9	●				●
10		●	●		
11		●		●	
12		●			●
13			●	●	
14			●		●
15				●	●
16	●	●	●		
17	●		●	●	
18	●			●	●
19	●	●		●	
20	●	●			●
21		●	●	●	
22		●		●	●
23		●	●		●
24			●	●	●
25	●		●		●
26	●	●	●	●	
27		●	●	●	●
28	●		●	●	●
29	●	●		●	●
30	●	●	●		●
31	●	●	●	●	●

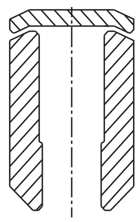
Table 1-C380

Mul-T-Lock® Pinning Abbreviation for Classic and Interactive®



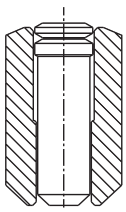
B 3
1 -

- External Plug Pin B
- Internal Plug Pin 3
- No Internal Master Disk
- External Master Disk #1



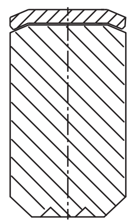
B X
1 +

- External Plug Pin B
- No Internal Plug Pin
- Solid Master Disk #1



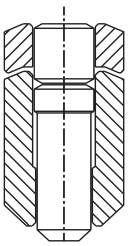
C 2
- 1

- External Plug Pin C
- Internal Plug Pin 2
- Internal Master Disk #1
- No External Master Disk



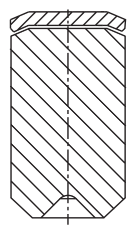
C C
1 +

- Solid Plug Pin CC
- Solid Master Disk #1



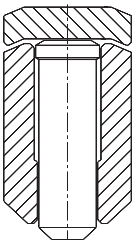
A 1
3 4

- External Plug Pin A
- Internal Plug Pin 1
- Internal Master Disk #4
- External Master Disk #3



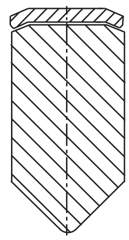
C –
1 +

- Solid Plug Pin C-
- Solid Master Disk #1



B 3
2 +

- External Plug Pin
- Internal Plug Pin
- Solid Master Disk #2



B +
1 +

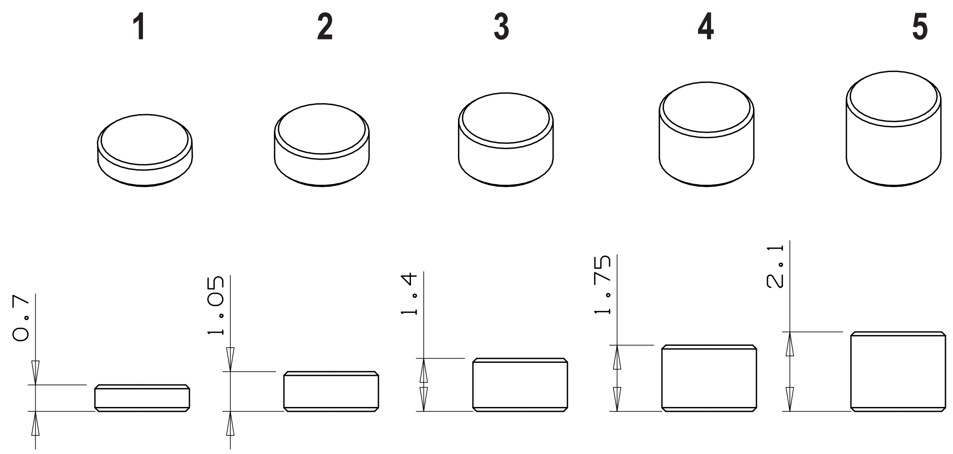
- Solid Plug Pin B+
- Solid Master Disk #1

C390V1

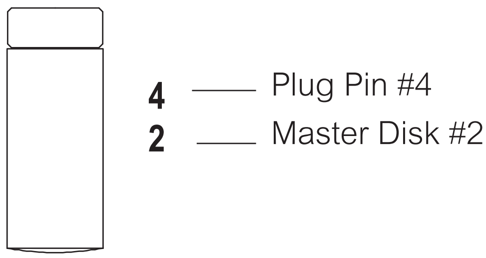
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7X7® and Integrator™ Systems Master Components

Available Master Disks



Pinning Abbreviations



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C410V1

Site survey

Site ____________ **System name** ____________ **date**________

Contact person ____________ System number ____________

Phone number ____________ Locksmith ____________ Page no.____ Of___

#	Product types	Location	Qunt.	Finish	Profile	Key function	Qunt. of Keys	Hardware	Door & frame	Remarks

Cylinders - General Instructions

NOTE: Make sure to mount the E-clip so that its rounded edges face the cylinder body and confirm that it is properly aligned with the plug slot. The E-clip should be replaced and not reassembled
‘

After re assembly, make sure that the cylinder operates properly with the new key on both sides.

Lubricate the cylinder using only Mul-T-Lock® “lock lubricating spray”. Do not use graphite or WD-40.

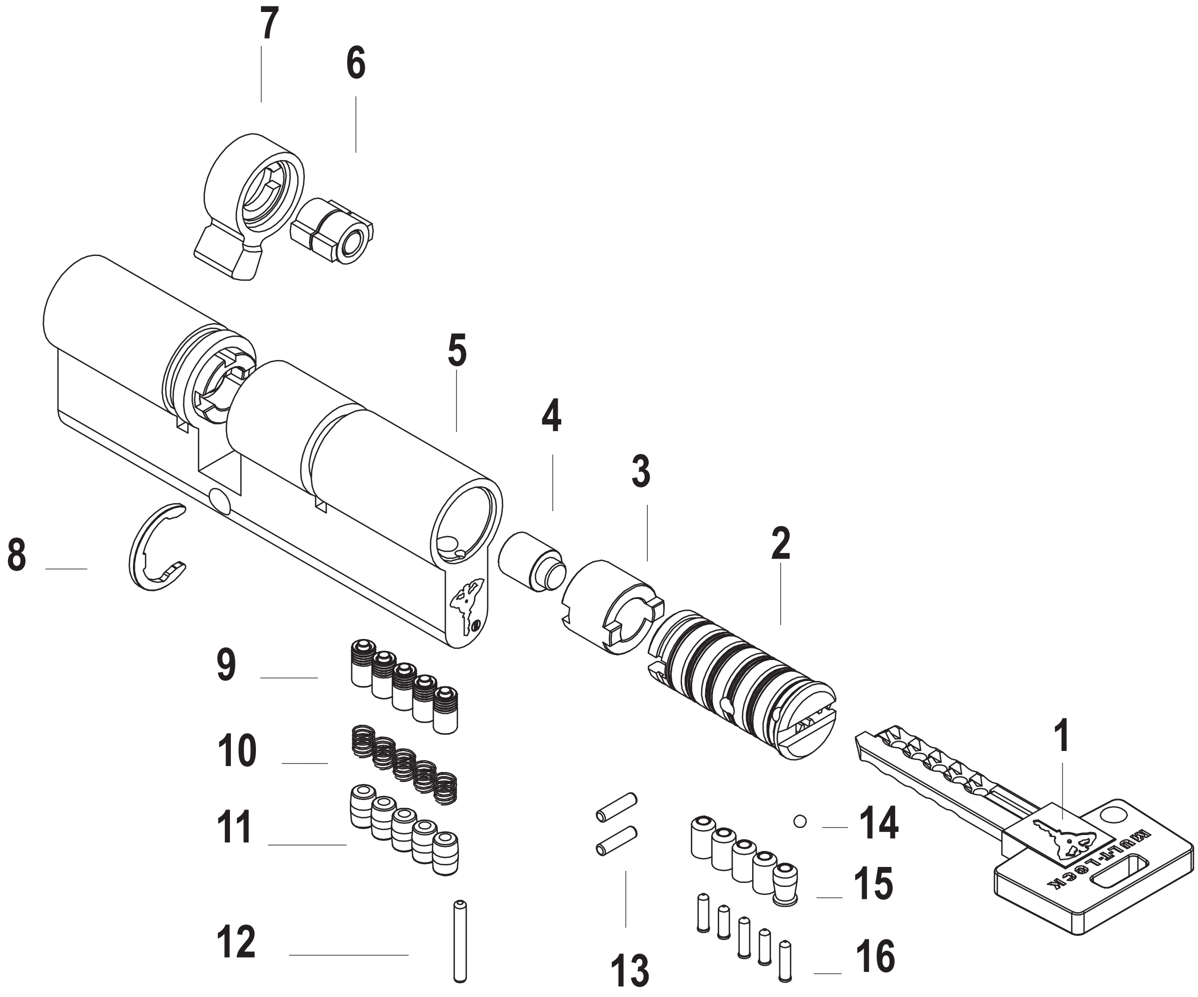
NOTE: Do not apply torque above 4N/M for fixing cylinder screws!
Do not use a Power Driver to secure cylinder screws!

When assembling plugs with master key disks, you must make sure that all the master pins are out. There are two options:

- Use a key with the deepest cuts possible in the system, in all the chambers. If no key exists like that, go to the next option.
- Remove the plug without a follower, take out all the master pins that were inside the body, and reload the body.

Euro Cylinder

Exploded view



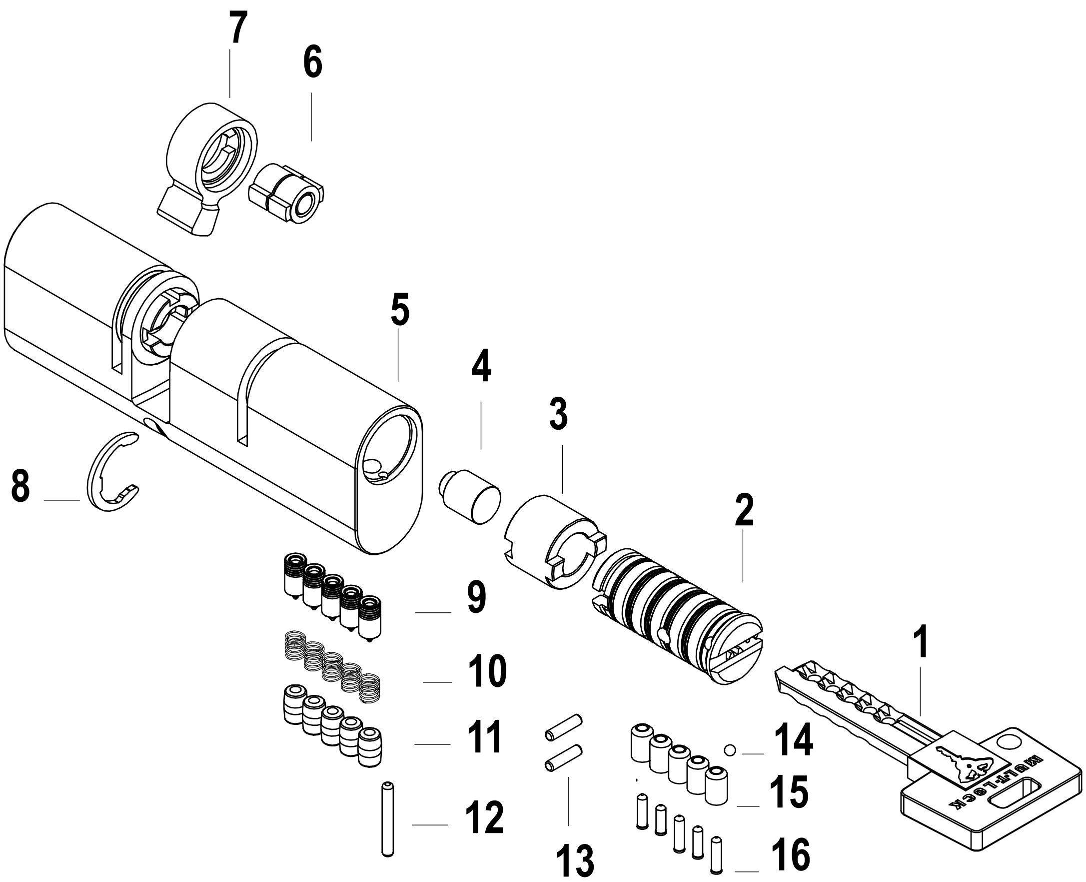
No.	Part	No.	Part	No.	Part
1	Key	7	Cam	13	Anti-Drilling Pins
2	Plug	8	E-Clip	14	Anti-Drilling Ball
3	Plug Adaptor	9	Combined Pins	15	External Plug Pins
4	Plug Spacer	10	Springs	16	Internal Plug Pins
5	Body	11	Body plugs		
6	Coupling	12	Anti-Drilling Pin		

C430V1

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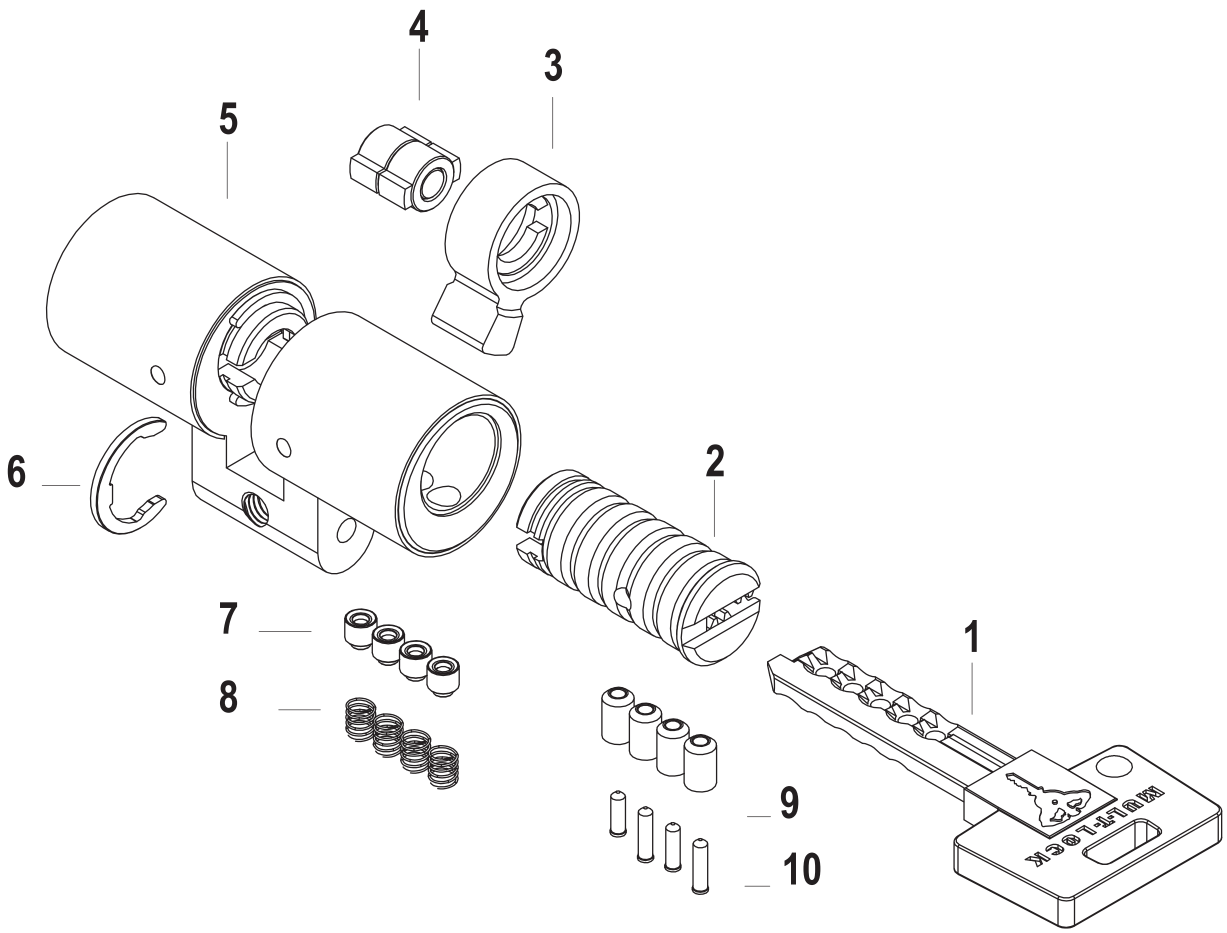
U.K. Oval Profile cylinder



No.	Part	No.	Part	No.	Part
1	Key	7	Cam	13	Anti-Drilling Pins
2	Plug	8	E-Clip	14	Anti-Drilling Ball
3	Plug Adaptor	9	Combined Pins	15	External Plug Pins
4	Plug Spacer	10	Springs	16	Internal Plug Pins
5	Body	11	Body Plugs		
6	Coupling	12	Anti-Drilling Pin		

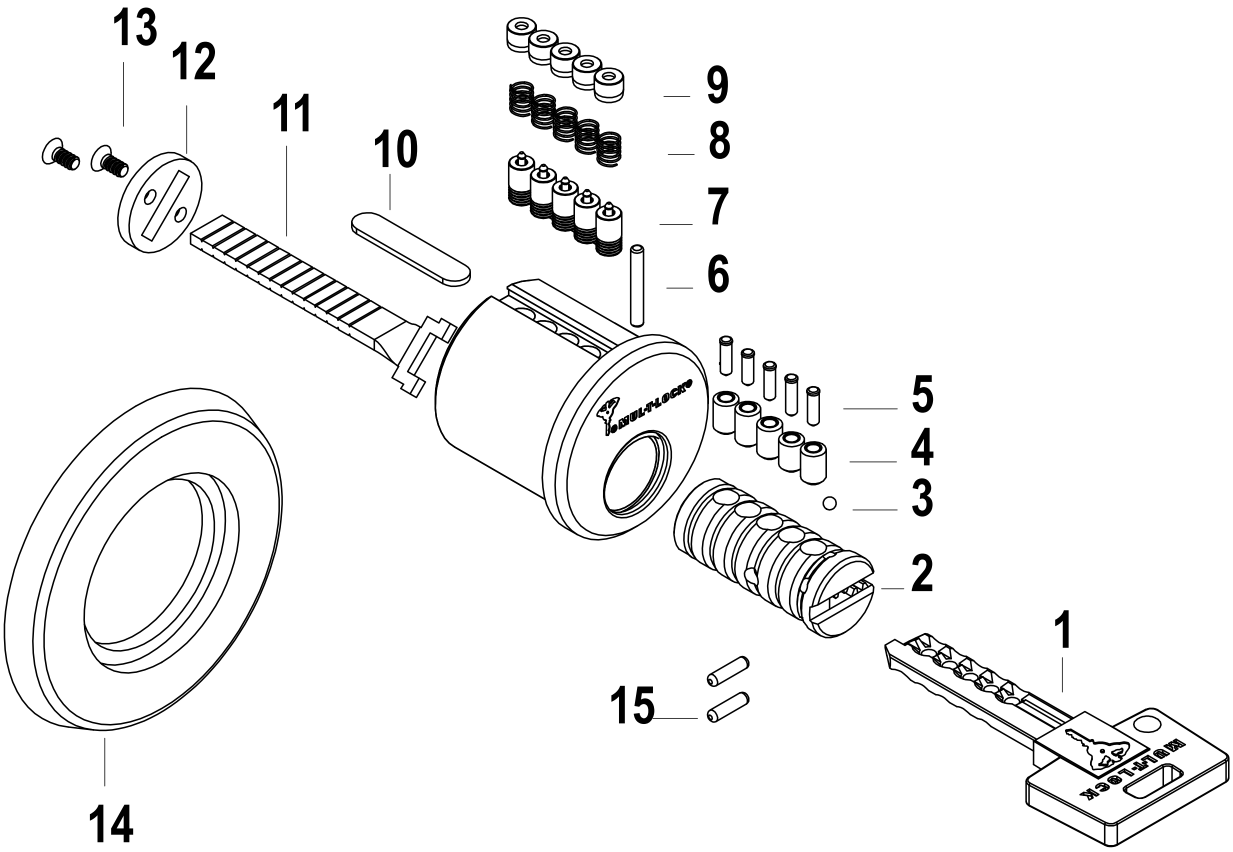
C440V1

Swiss Profile Cylinder



No.	Part	No.	Part	No.	Part
1	Key	5	Body	9	External Plug Pins
2	Plug	6	E-Clip	10	Internal Plug Pins
3	Cam	7	Combined Pins		
4	Coupling	8	Springs		

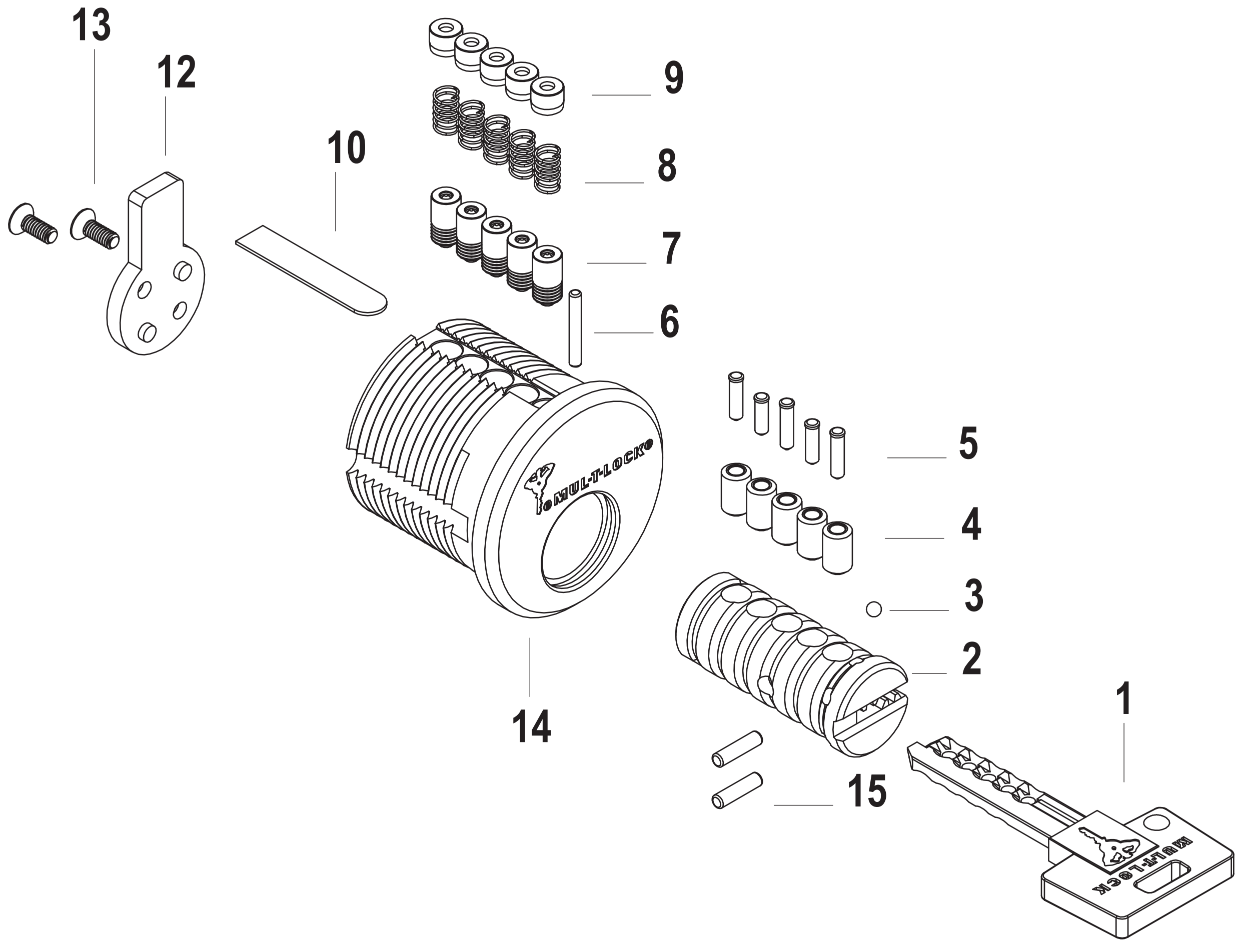
Rim Cylinder



No.	Part	No.	Part	No.	Part
1	Key	6	Anti-Drilling Pin	11	Tail
2	Plug	7	Combined Pins	12	Tail Locating Plate
3	Anti-Drilling Ball	8	Springs	13	Screws
4	External Plug Pins	9	Plastic Spacers	14	Spacer Ring
5	Internal Plug Pins	10	Cover Plate	15	Anti-Drilling Pins

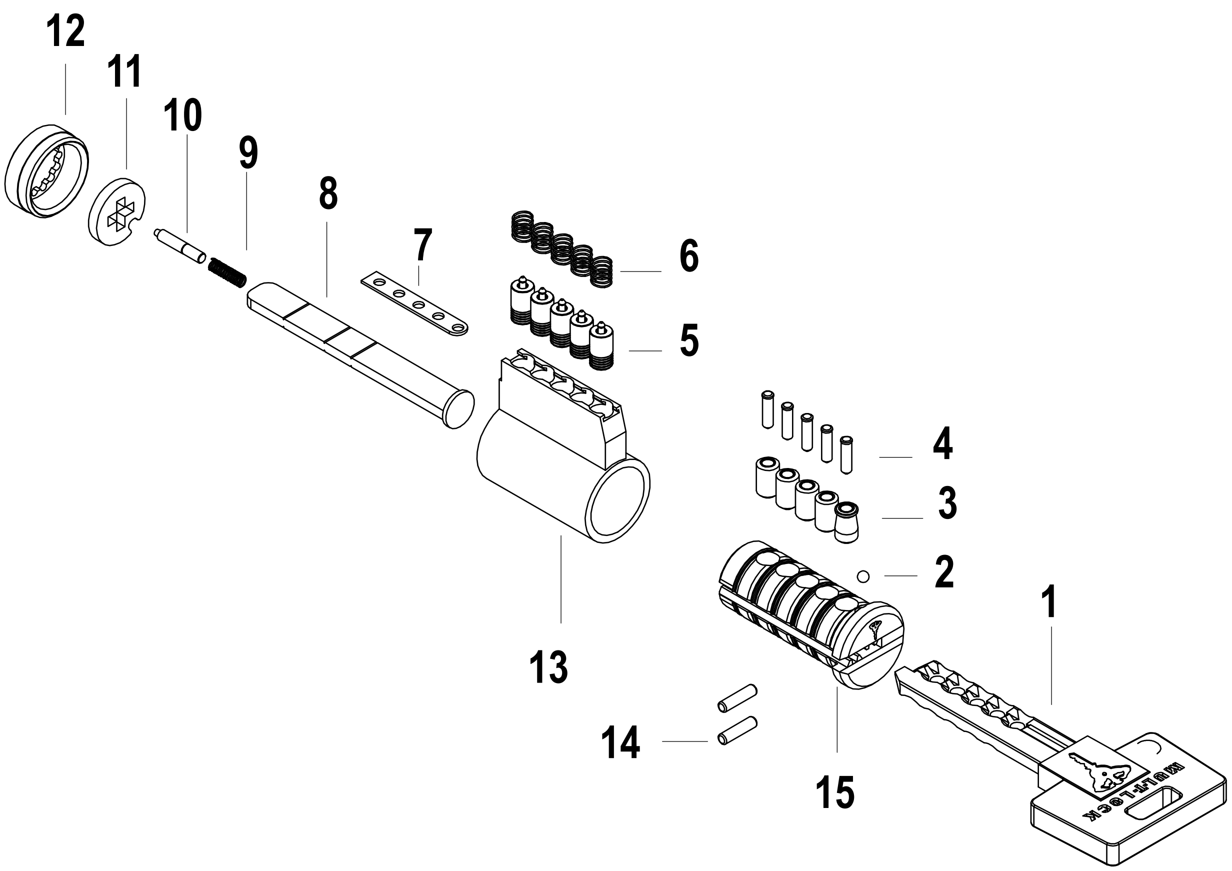
C460V1

Mortise Cylinder



No.	Part	No.	Part	No.	Part
1	Key	6	Anti-Drilling Pin	11	Tail
2	Plug	7	Combined Pins	12	Tail Locating Plate
3	Anti-Drilling Ball	8	Springs	13	Screws
4	External Plug Pins	9	Plastic Spacers	14	Spacer Ring
5	Internal Plug Pins	10	Cover Plate	15	Anti-Drilling Pins

K.I.K Cylinder

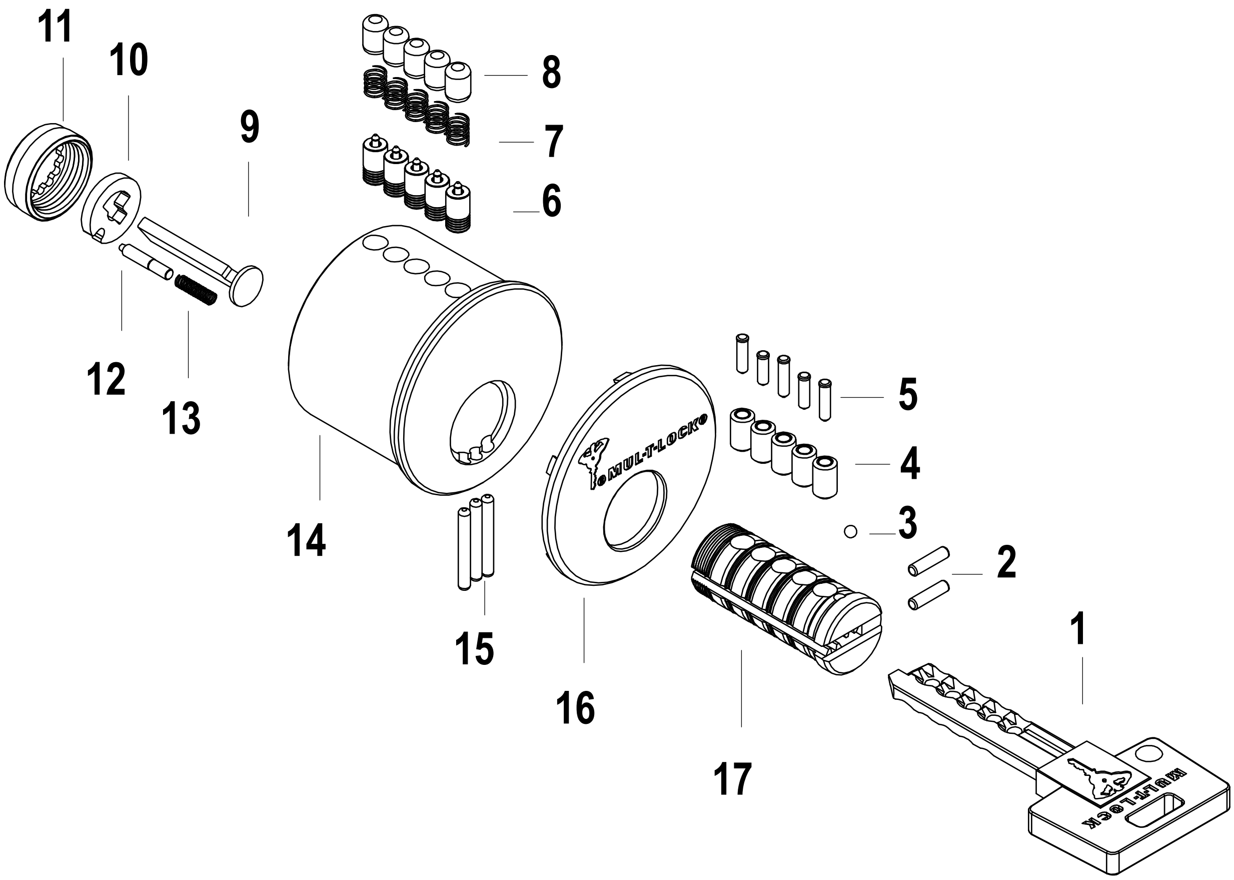


No.	Part	No.	Part	No.	Part
1	Key	6	Body Pprings	11	Tail Locating Disc
2	Anti-Drilling Ball	7	Cover Plate	12	Nut
3	External Plug Pins	8	Tail	13	Body
4	Internal Plug Pins	9	Spring	14	Anti-Drilling Pin
5	Combined Pins	10	Nut Locking Pin		Plug

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C480V1

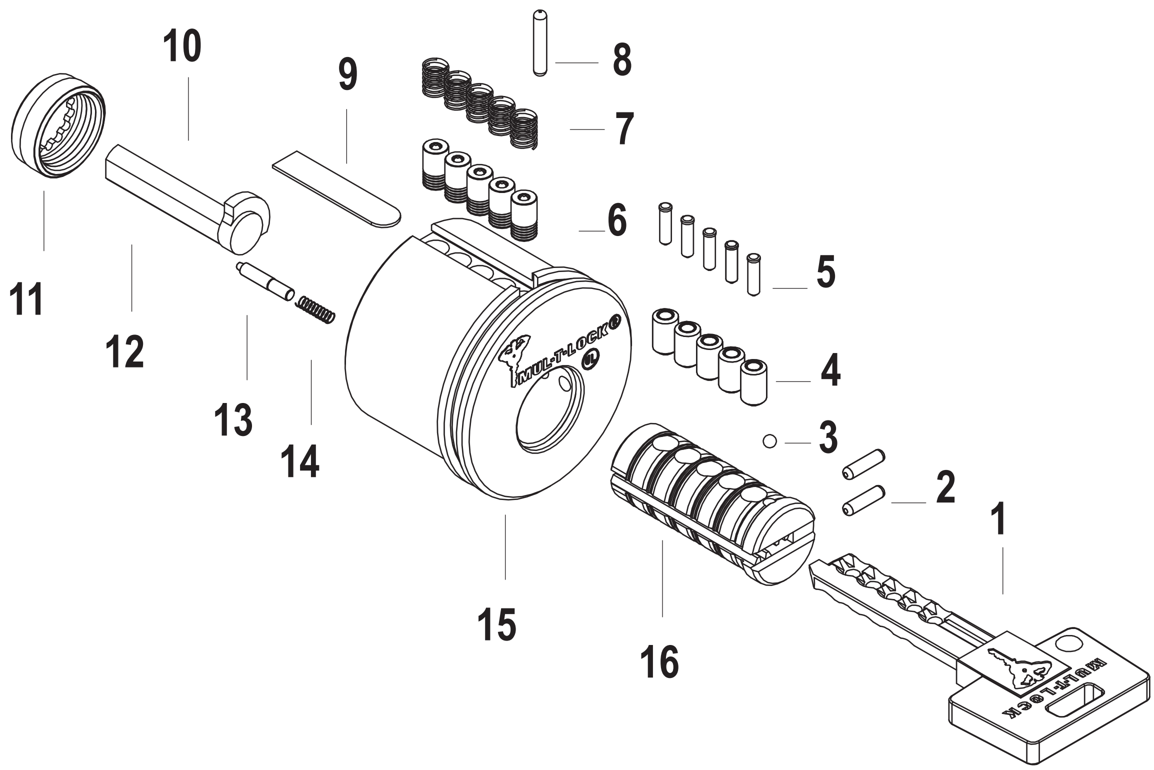
Cylinder for "Weiser" Type Locks- "Prestige"



No.	Part	No.	Part	No.	Part
1	Key	7	Body Springs	13	Spring
2	Anti-Drilling Pins	8	Body Plugs	14	Body
3	Anti-Drilling Ball	9	Tail	15	Anti-Drilling Pins
4	External Plug Pins	10	Tail Locating Plate	16	Decorative Cover
5	Internal Plug Pins	11	Nut	17	Plug
6	Combined Pins	12	Nut Locking Pin		

Cylinder for "Kwikset" Type Locks- "Titan"

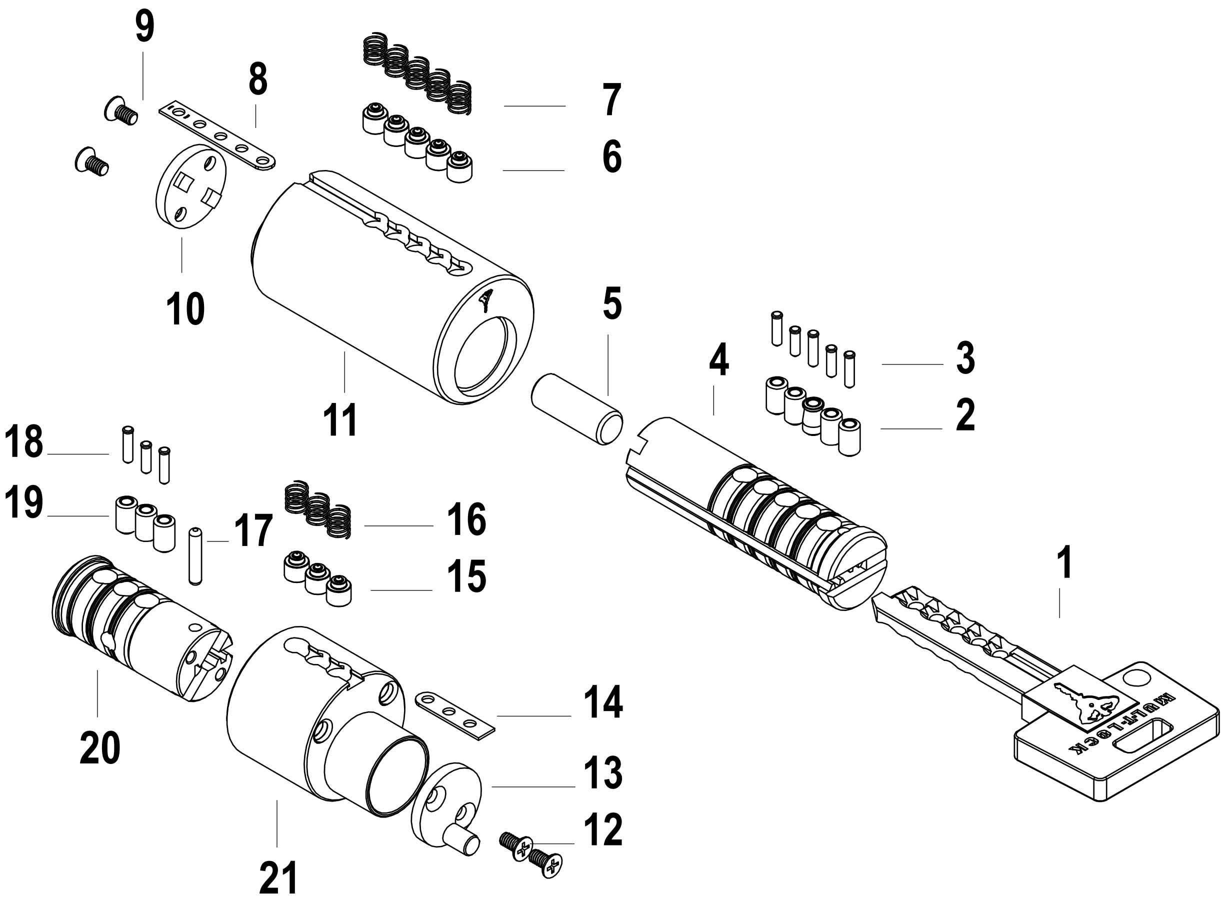
Exploded view



No.	Part	No.	Part	No.	Part
1	Key	7	Body Springs	13	Spring
2	Anti-Drilling Pins	8	Body Plugs	14	Body
3	Anti-Drilling Ball	9	Tail	15	Anti-Drilling Pins
4	External Plug Pins	10	Tail Locating Plate	16	Plug
5	Internal Plug Pins	11	Nut	17	
6	Combined Pins	12	Nut Locking Pin		

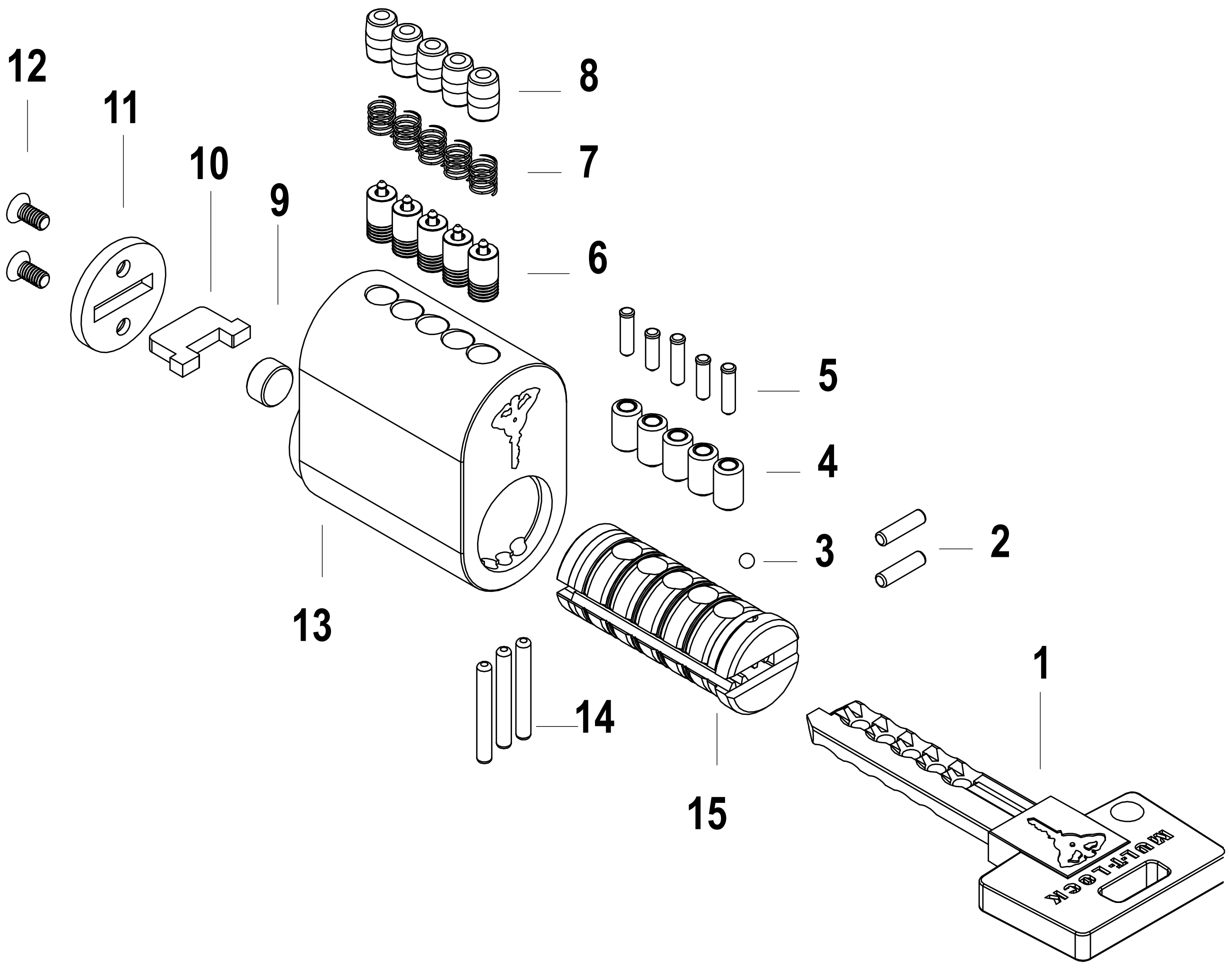
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Cylinder for "Vega" Type Locks



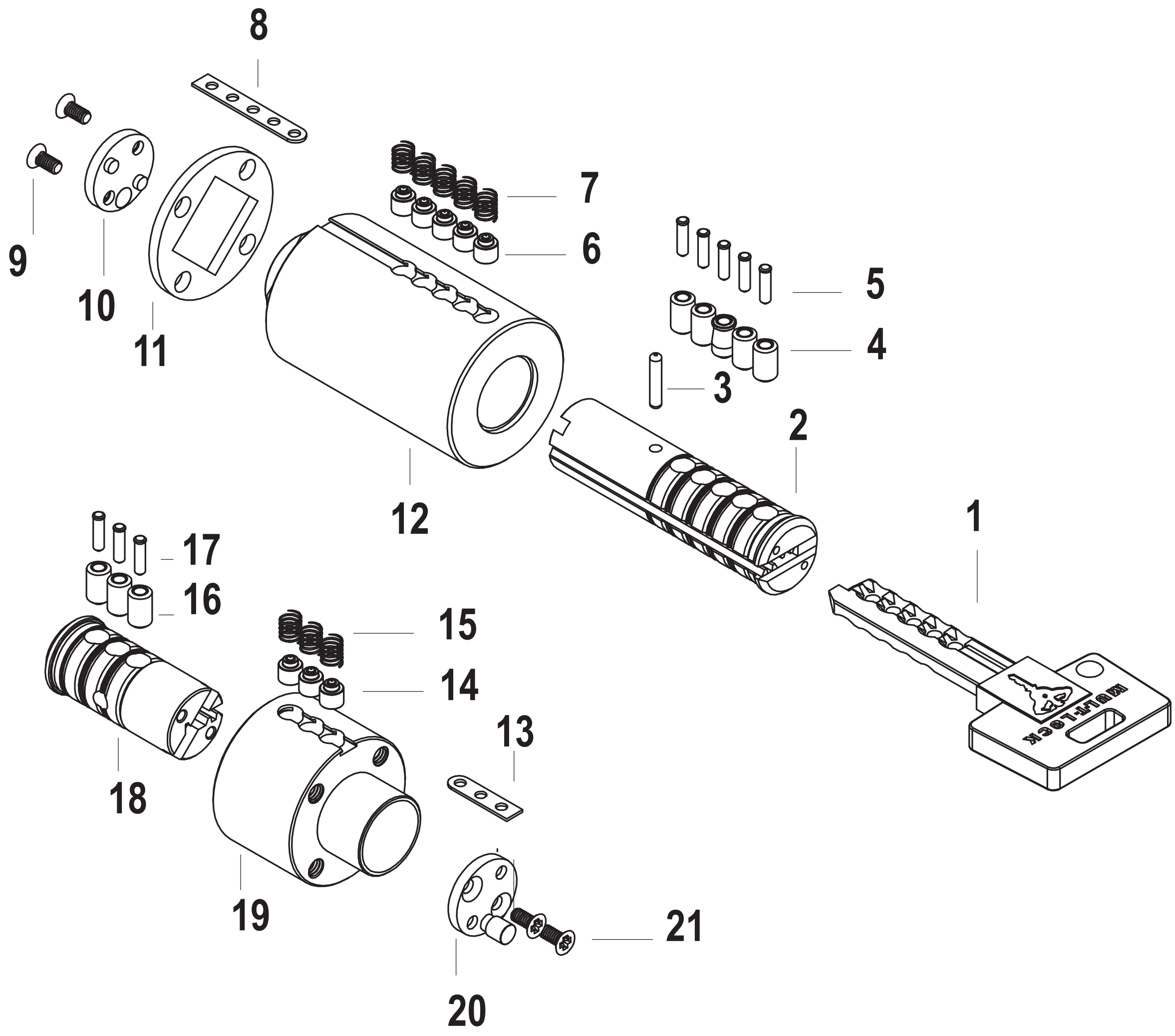
No.	Part	No.	Part	No.	Part
1	Key	8	Cover Plate	15	Combined Pin (22mm)
2	External Plug Pins	9	Screws	16	Body Springs (22mm)
3	Internal Plug Pins	10	Locating Plate	17	Key Stopper
4	External Cylinder Plug	11	Body External Cylinder	18	Internal Plug Pins
5	Key Stopper	12	Screws	19	External Plug Pins
6	Combined Pin (22mm)	13	Cam Internal Cylinder	20	Plug Internal Cylinder
7	Body Springs (22mm)	14	Cover Plate	21	Body Internal Cylinder

Cylinder For "ASSA" Type Locks



No.	Part	No.	Part	No.	Part
1	Key	6	Combined Pins	11	Tail Locating Plate
2	Anti-Drilling Pins	7	Springs	12	Screws
3	Anti-Drilling Ball	8	Body Plugs	13	Body
4	External Plug Pins	9	Key Stopper	14	Anti-Drilling Pins
5	Internal Plug Pins	10	Tail	15	Plug

Cylinder for "Keso" Type Locks

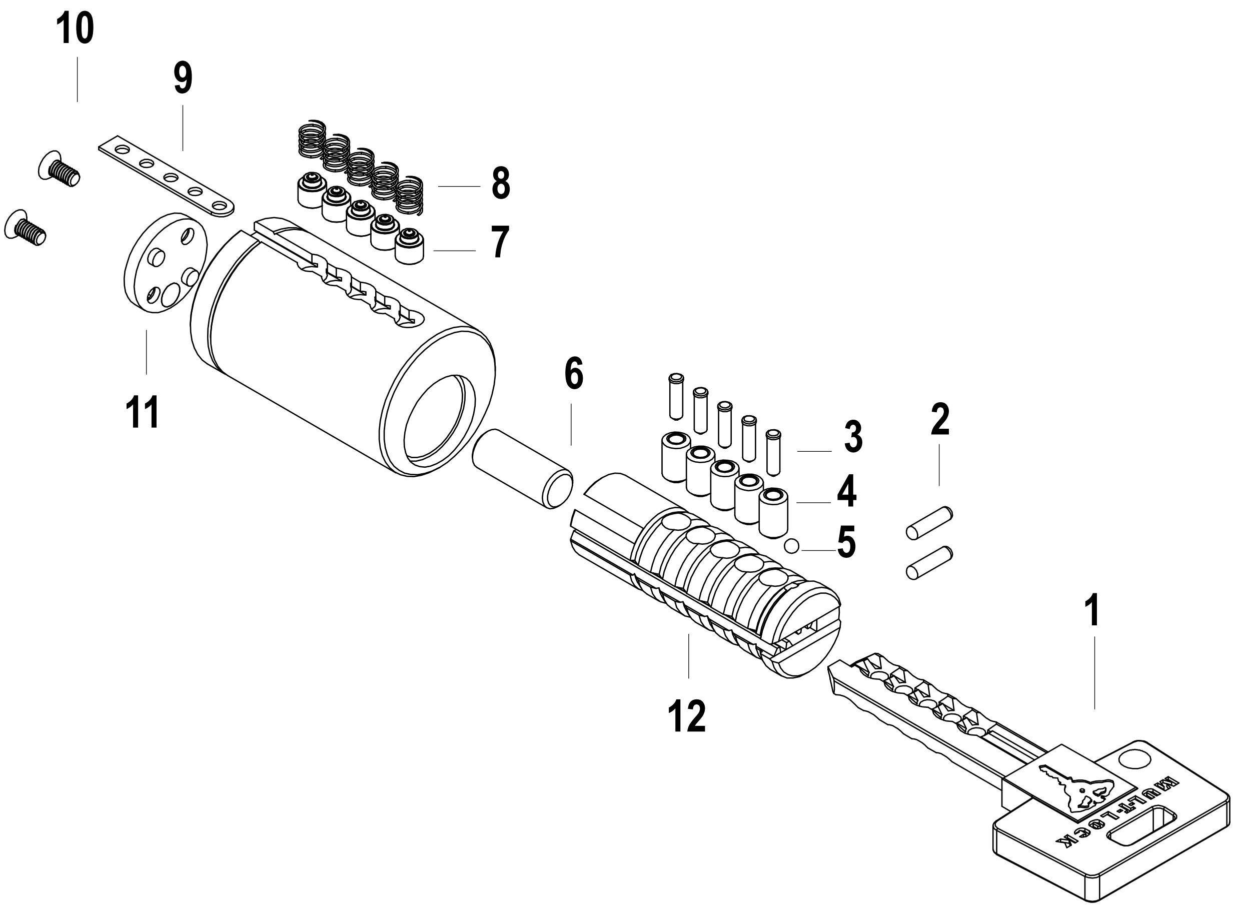


No.	Part	No.	Part	No.	Part
1	Key	8	Cover Plate	15	Body Springs (22mm)
2	External Cylinder Plug	9	Cam	16	External Plug Pins
3	Key Stopper	10	Screws	17	Internal Plug Pins
4	External Plug Pins	11	Ring	18	Plug Internal Cylinder
5	Internal Plug Pins	12	External Cylinder Body	19	Body Internal Cylinder
6	Combined Pin (22mm)	13	Cover Plate Internal Cyl.	20	Cam
7	Body Springs (22mm)	14	External Plug Pins	21	Screws

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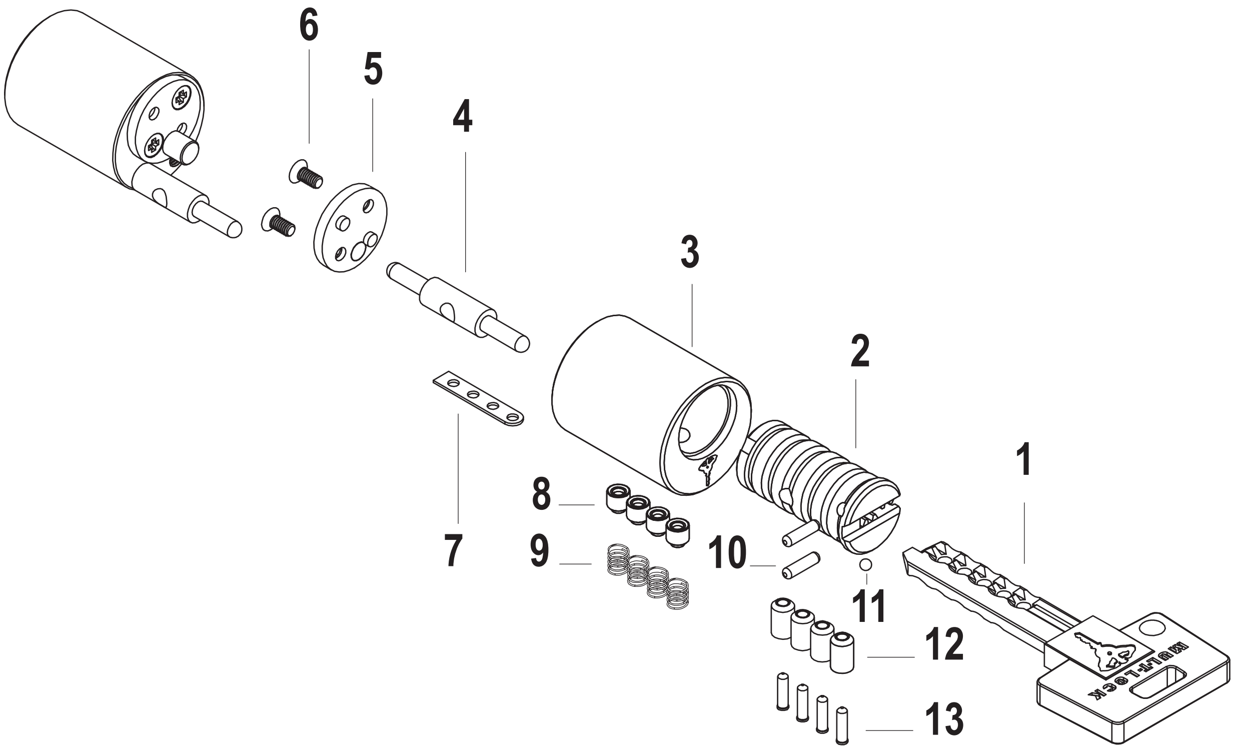
Cylinder for "City" Type Locks



No.	Part	No.	Part	No.	Part
1	Key	5	Internal Plug Pins	9	Cover Plate
2	Anti-Drilling Pins	6	Key Stopper	10	Screws
3	Anti-Drilling Ball	7	Combined Pin (22mm)	11	Locating Plate
4	External Plug Pins	8	Body Springs (22mm)	A	Plug

C540V1

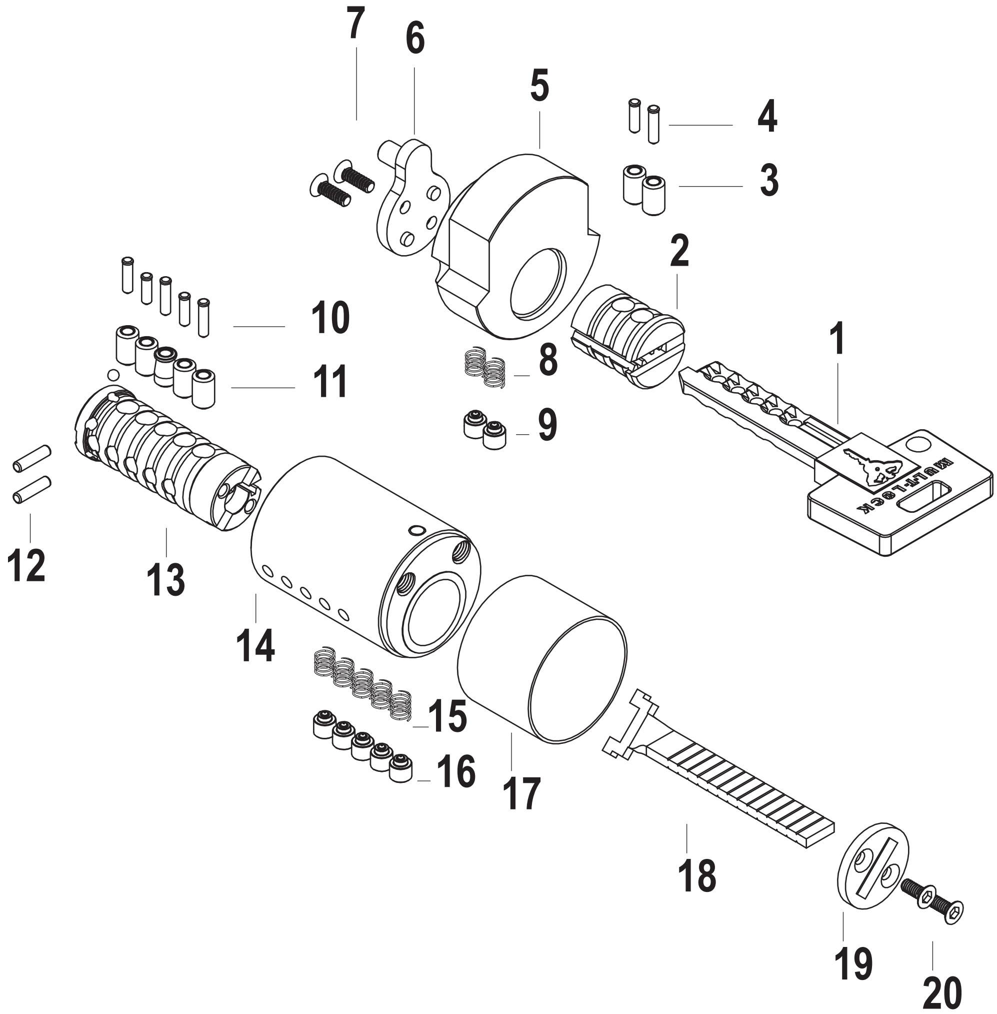
Cylinder for "Blindex" Type Locks



No.	Part	No.	Part	No.	Part
1	Key	6	Screw	11	Anti-Drilling Ball
2	Plug	7	Cover Plate	12	External Plug Pins
3	Body	8	Combined Pin (22mm)	13	Internal Plug Pins
4	Pin	9	Body Springs (22mm)		
5	Cam	10	Anti-Drilling Pin		

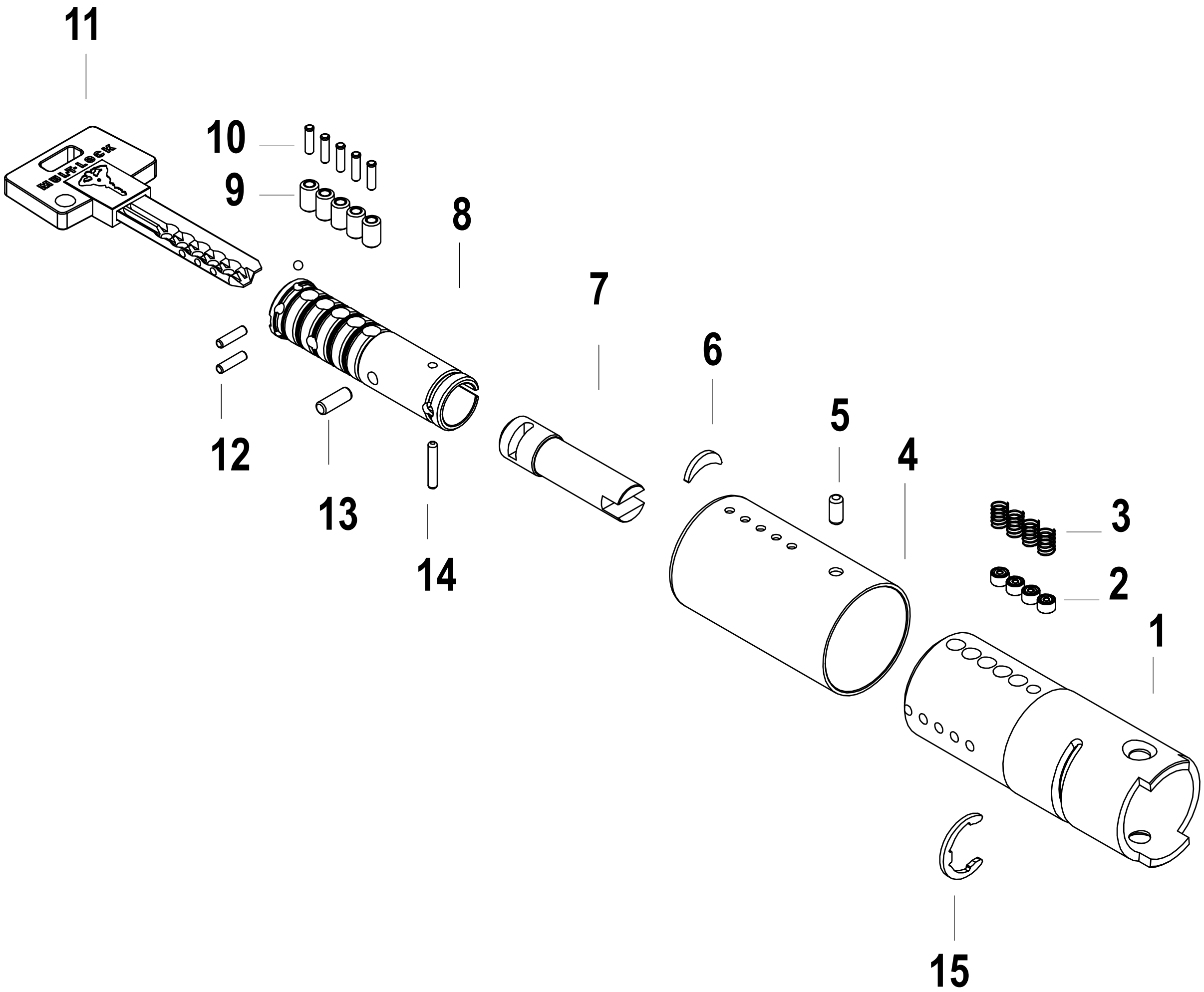
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Cylinder for "Cisa" Type Locks



No.	Part	No.	Part	No.	Part
1	Key	8	Body Springs (22mm)	15	External Cylinder Body
2	Internal Cylinder Plug	9	Combined Pin (22mm)	16	Body Springs (22mm)
3	External Plug Pins	10	Internal Plug Pins	17	Combined Pin (22mm)
4	Internal Plug Pins	11	External Plug Pins	18	External Cylinder Body Cover
5	Internal Cylinder Body	12	Anti-Drilling Pin	19	Tail
6	Cam	13	Anti-Drilling Ball	20	Tail Locking Plate
7	Screws	14	External Cylinder Plug	21	Tail Screws

Cylinder for "Miwa" Type Hpd-27, Hpd-40 Locks



No.	Part	No.	Part	No.	Part
1	Body	6	Anti-Drilling Plate	11	Key
2	Combined Pin 22mm	7	Adaptor	12	Anti-Drilling Pins
3	Springs for 22mm	8	Plug	13	Key Stopper Pin
4	Body Cover	9	External Plug Pins	14	Pin
4	Pin	10	Internal Plug Pins	15	E-Clip

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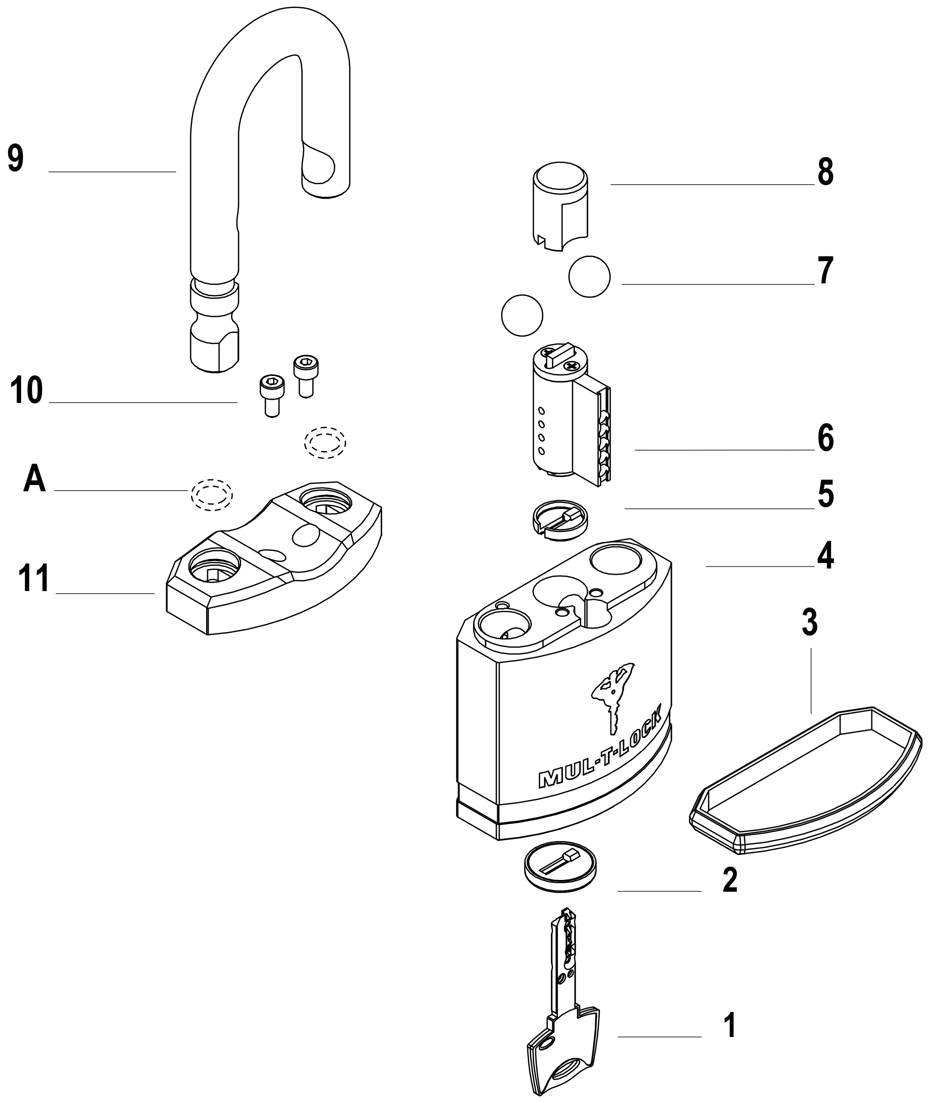
PADLOCKS & ACCESSORIES



MUL-T-LOCK®

Table of Contents

E-Series Padlock



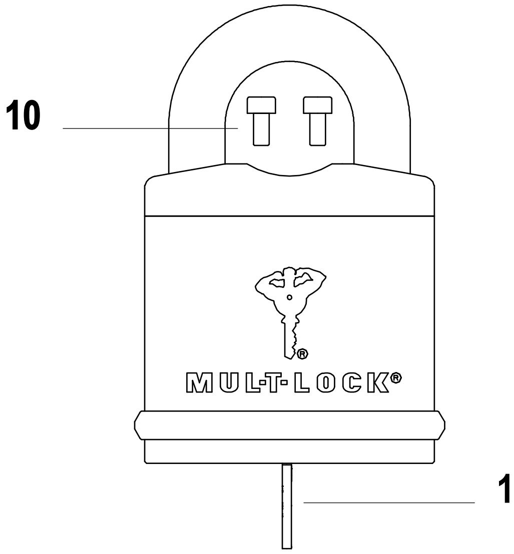
No.	Part	No.	Part	No.	Part
1	Key	5	*Cylinder Protector	9	Shackle for E-L
2	Shutter Assembly	6	Cylinder	10	**Torx Screw x2
3	Plastic Bumper	7	Ball Bearing x2	11	Upper Body for E-L
4	Lock Body	8	Activator Cam	A	O-Ring x2 (Optional)

*Not available in E-8 ** M3 - For E-8 & E-11
M4 - For E14 & E-18

Disassembly Instructions

1
Unlock the padlock with the operating key (1).

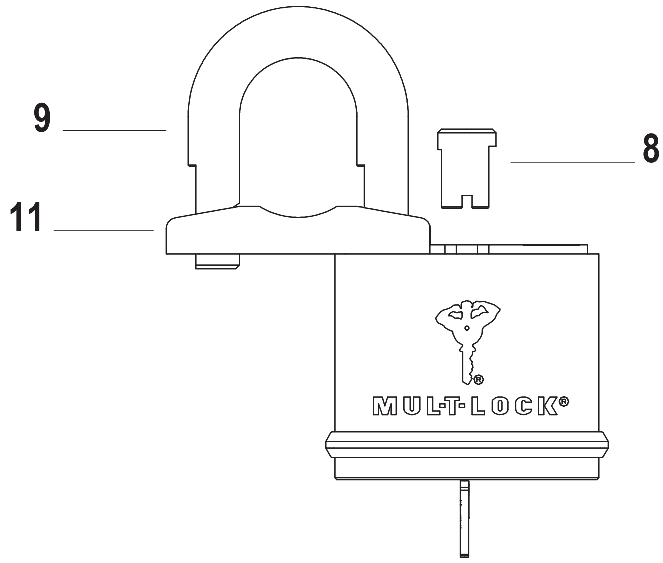
Unscrew two torx screws (10).



1

2
Rotate the shackle (9) together with the upper body (11) to the position shown.

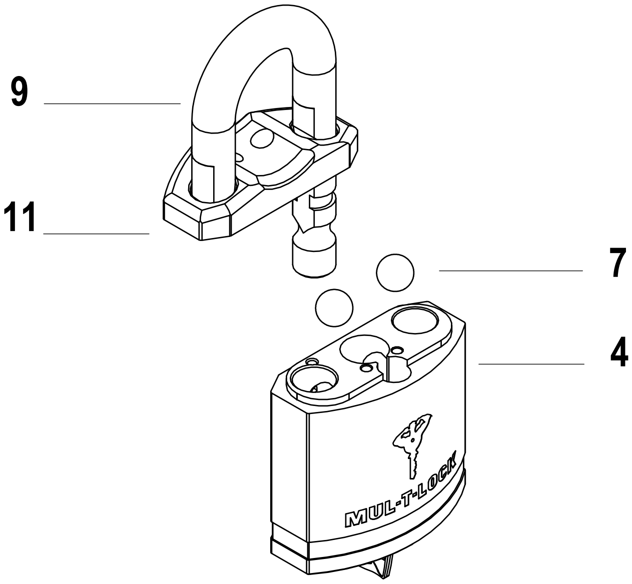
Remove the activator cam (8).



2

3

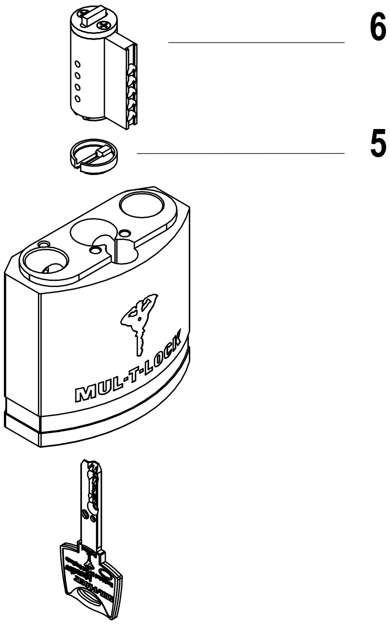
Remove shackle and upper body (9, 11) and two ball bearings (7).



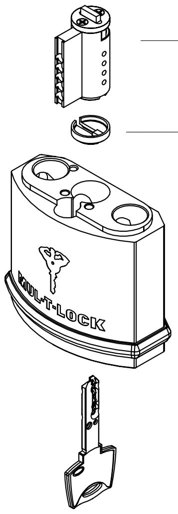
4

Take key out.

Remove cylinder (6) and cylinder protector (5).

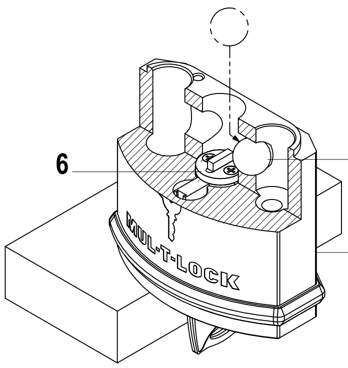


1
Insert cylinder protector (5) and cylinder (6).



2
Insert the key and rotate the cylinder (6) to open position.

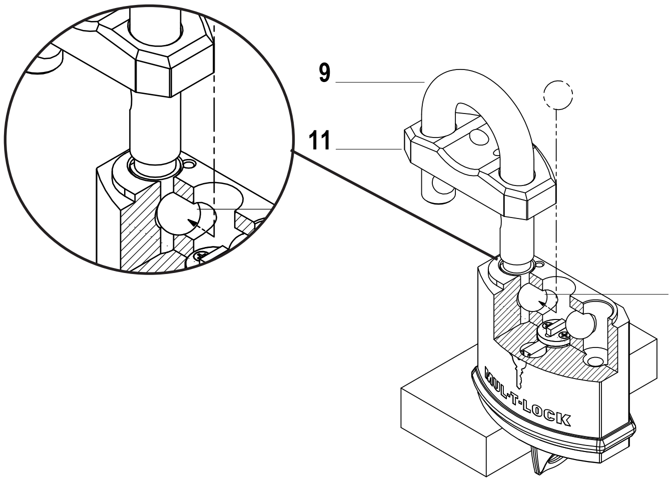
Put the lock body (4) on a horizontal surface and insert the first ball bearing (7) as shown.



3
Insert shackle and upper body (9, 11) in the position shown.

NOTE: Pay special attention to shackle position (height and rotation)!

Insert the second ball bearing (7).



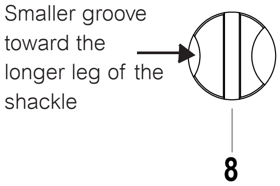
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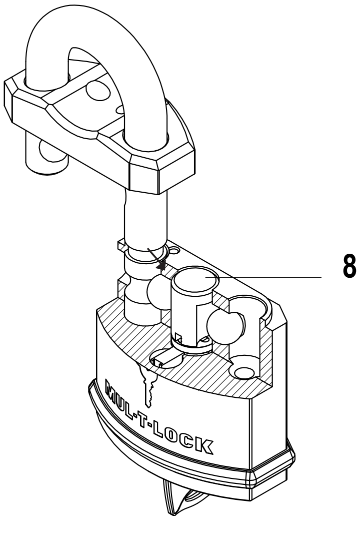
4

Insert the activator cam (8) to position shown.

NOTE: Activator cam (8) is not symmetrical... see diagram 4-a.

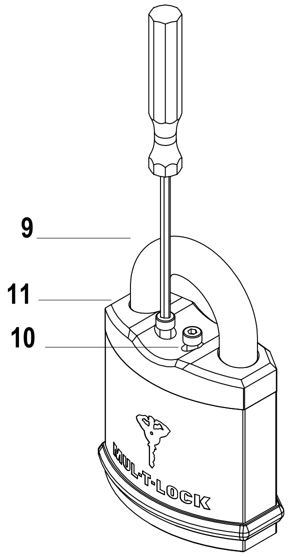
4-a





5

Rotate upper body and shackle (9, 11) to normal position and tighten the screws (10).



Shackle Assembly

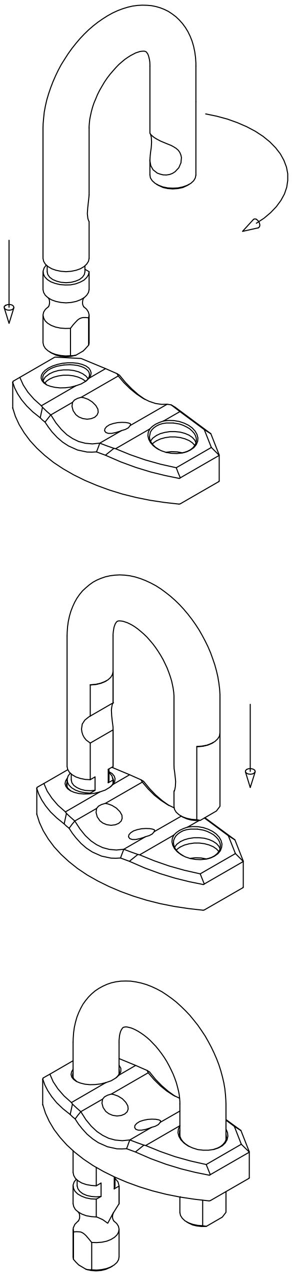
1

Insert the shackle into the upper body until it stops as shown in diagram a, rotate the shackle to position b and insert it fully into position c.

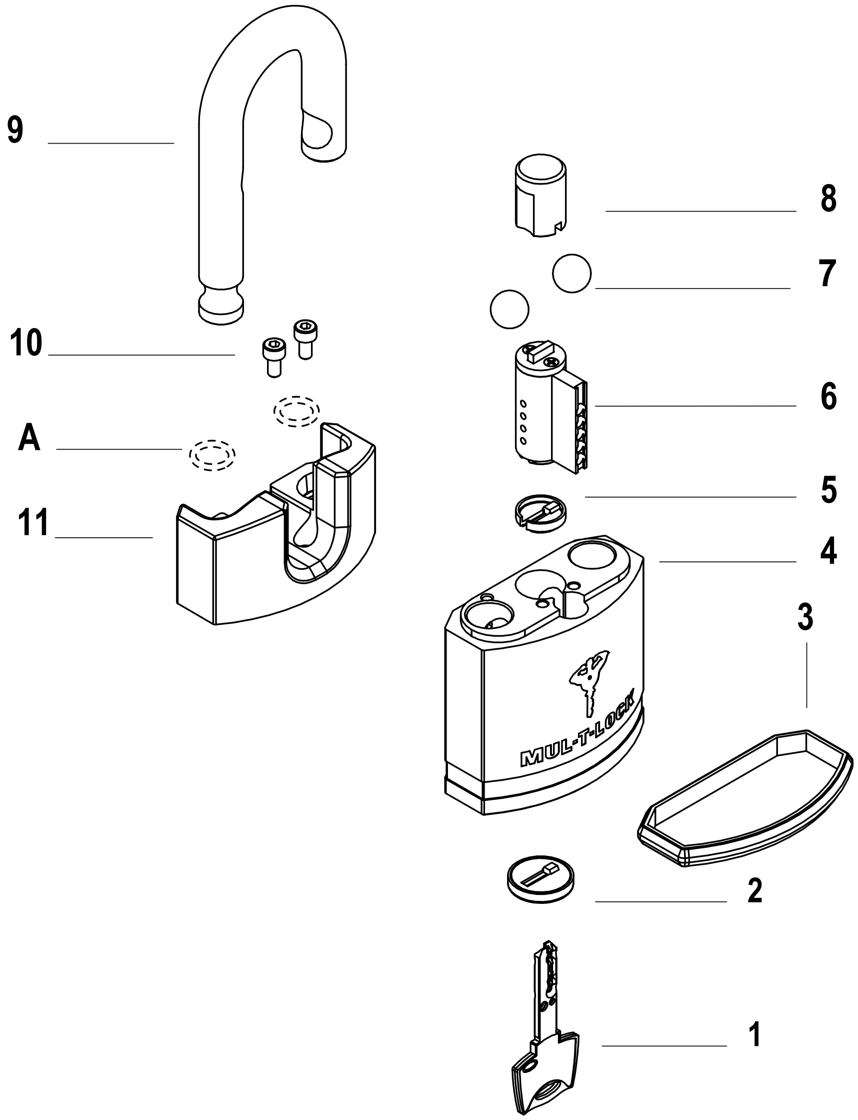
a

b

c



E-Series Padlock Protected Shackle



No.	Part	No.	Part	No.	Part
1	Key	5	*Cylinder protector	9	Shackle for E-H
2	Shutter Assembly	6	Cylinder	10	**Torx screw x2
3	Plastic Bumper	7	Ball Bearing x2	11	Upper Body for E-H
4	Lock Body	8	Activator Cam	A	O-Ring x2 (Optional)

*Not available in E-8 ** M3 - For E-8 & E-11
M4 - For E14 & E-18

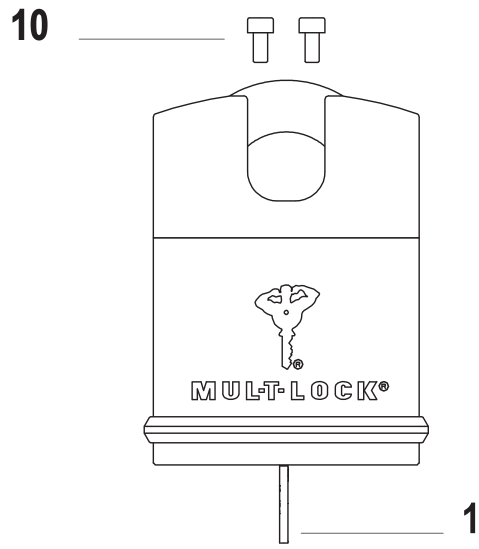
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E-Series Protected Shackle Disassembly Instructions

1

Unlock the padlock with the operating key (1).

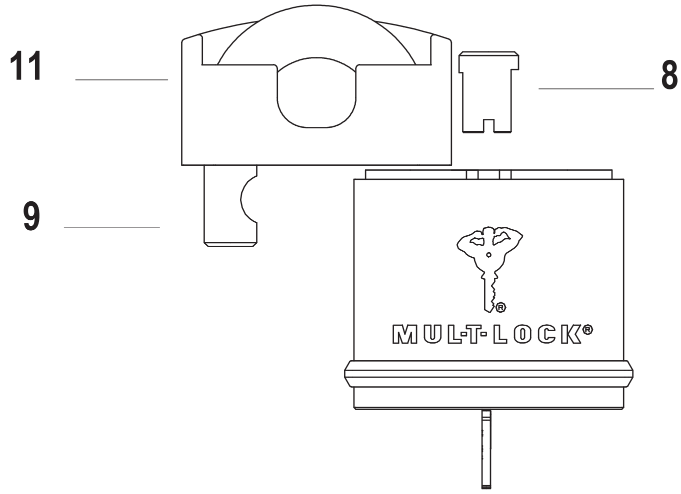
Unscrew two torx screws (10).



2

Rotate the shackle (9) together with the upper body (11) to the position shown.

Remove the activator cam (8).



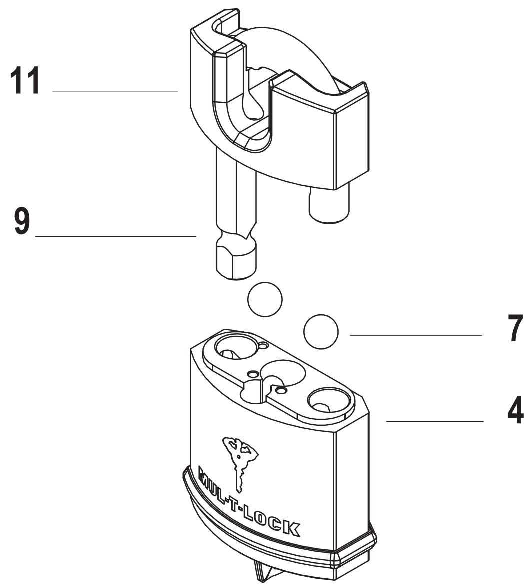
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3

Remove shackle and upper body (9, 11) and two ball bearings (7).

3

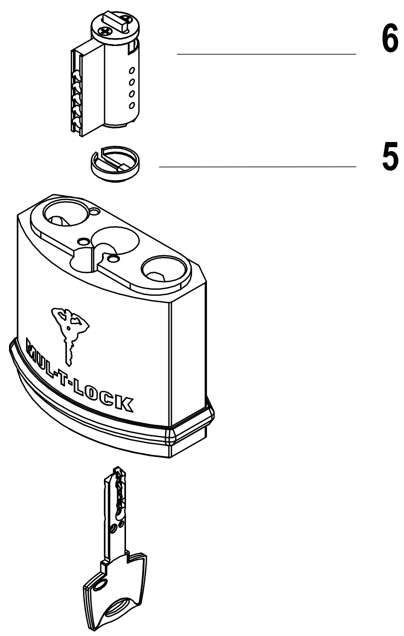


4

Take the key out.

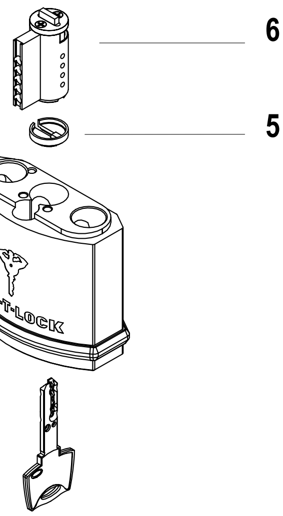
Remove cylinder (6) and cylinder protector (5).

4



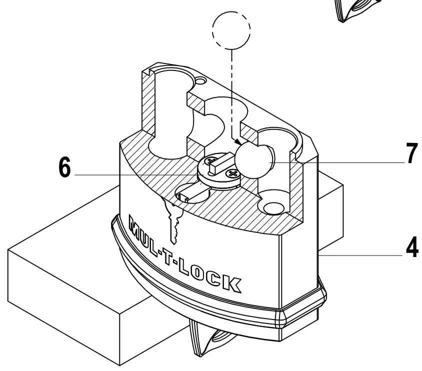
E-Series Protected Shackle Assembly Instructions

1
Insert cylinder protector (5) and cylinder (6).



2
Insert the key and rotate the cylinder (6) to open position.

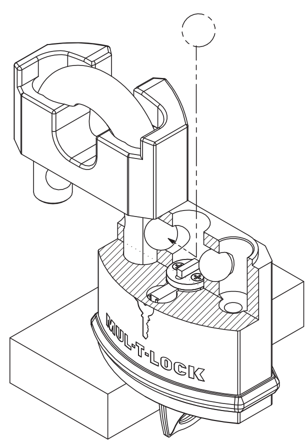
Put the lock body (4) on a horizontal surface and insert the first ball bearing (7) as shown.



3
Insert shackle and upper body (9, 11) in the position shown.

Insert the second ball bearing (7).

NOTE: The ball bearing will not go all the way in.



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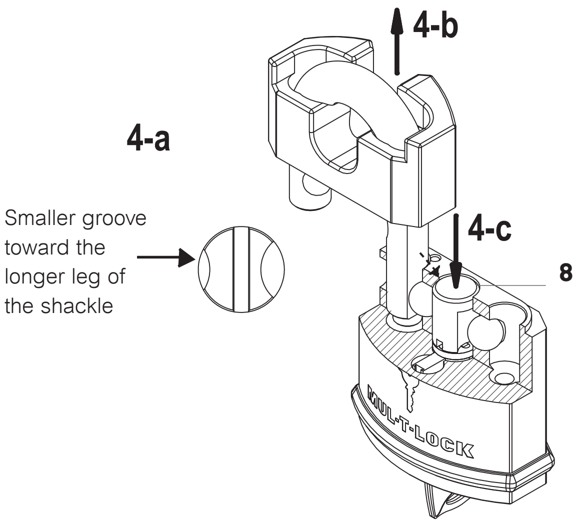
4

Insert the activator cam (8) into the position shown.

When you start, it will not go all the way in! To get it to the right position, pull the shackle up (4-b) while applying light pressure on the activator cam (4-c).

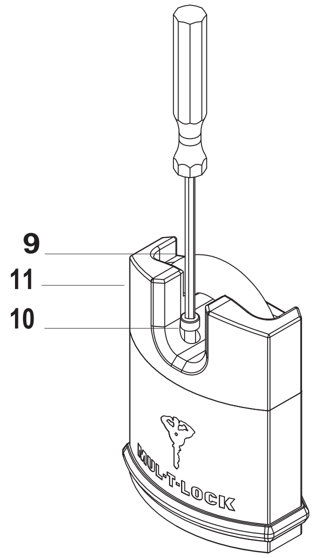
When the shackle reaches the right position it will snap into place.

NOTE: Activator cam (8) is not symmetrical... see diagram 4-a.



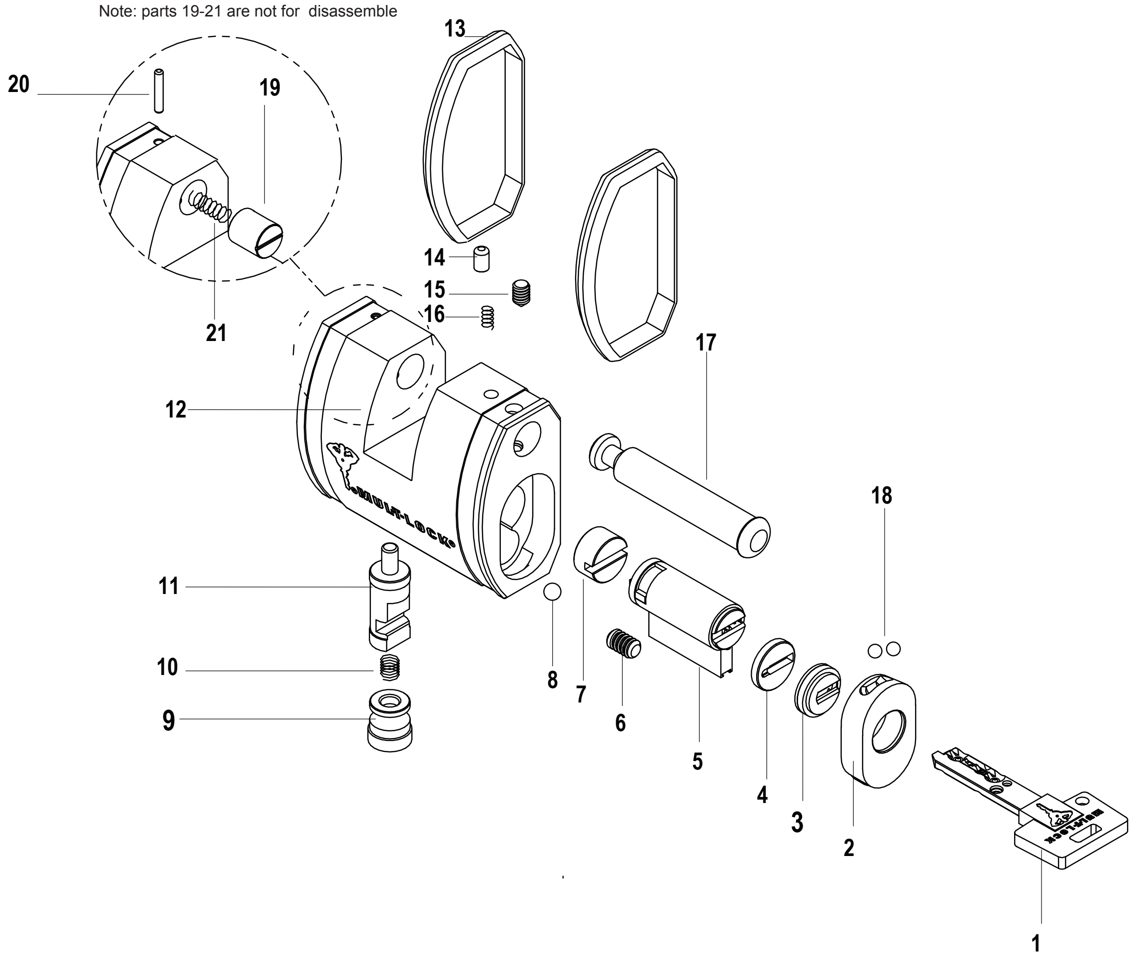
5

Rotate upper body and shackle (9, 11) to the normal position and tighten the screws (10).



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E-Series Sliding bolt (SBE)



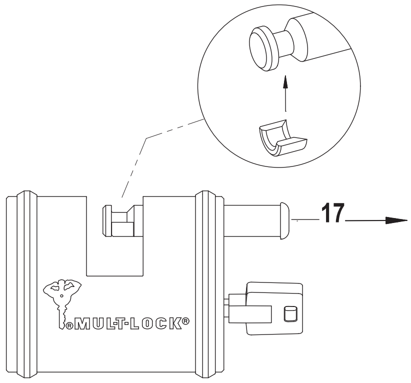
No.	Part	No.	Part	No.	Part
1	Key	8	Activator Cam	15	Bolt Retaining Pin
2	Cylinder Front Cover	9	Ball Bearing 5mm	16	Socket Set Screw
3	Shutter Assembly	10	Plug	17	Spring
4	Cylinder Protector	11	Spring	18	Sliding Bolt
5	Disk	12	Locking Bolt	19	Ball Bearing 4mm
6	KIK Cylinder	13	Lock Body	20	Bolt Pusher
7	Socket Set Screw	14	Bumper X 2		

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SBE Disassembly Instruction

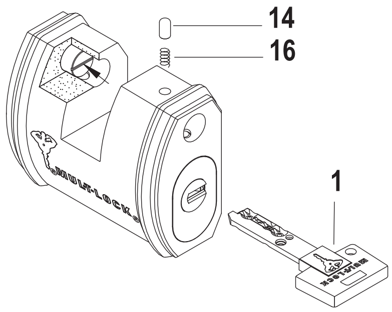
1

Unlock the padlock with the operating key.
Mount on the bolt disassembling ring and Remove the bolt (17) by Pulling it out .



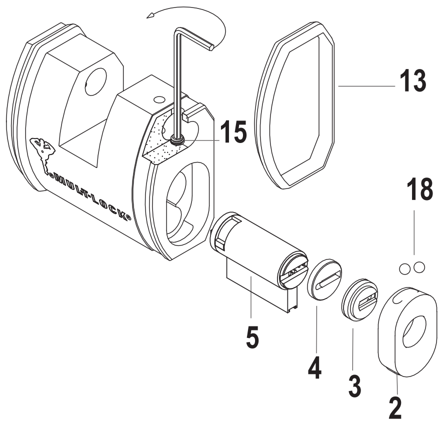
2

Take out pin and spring (14,16).
Push back the bolt pusher until the latch (11) comes up .
Take out the key (1).



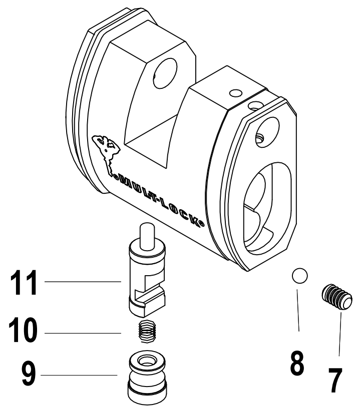
3

Remove right bumper (13).
Using Allen Wrench 2.5 mm go into hole beneath bumper and loosen screw (15) until you feel resistance.
Now cylinder front cover (2) is free, via opening in side Remove inner parts Of the body (3,4,5)



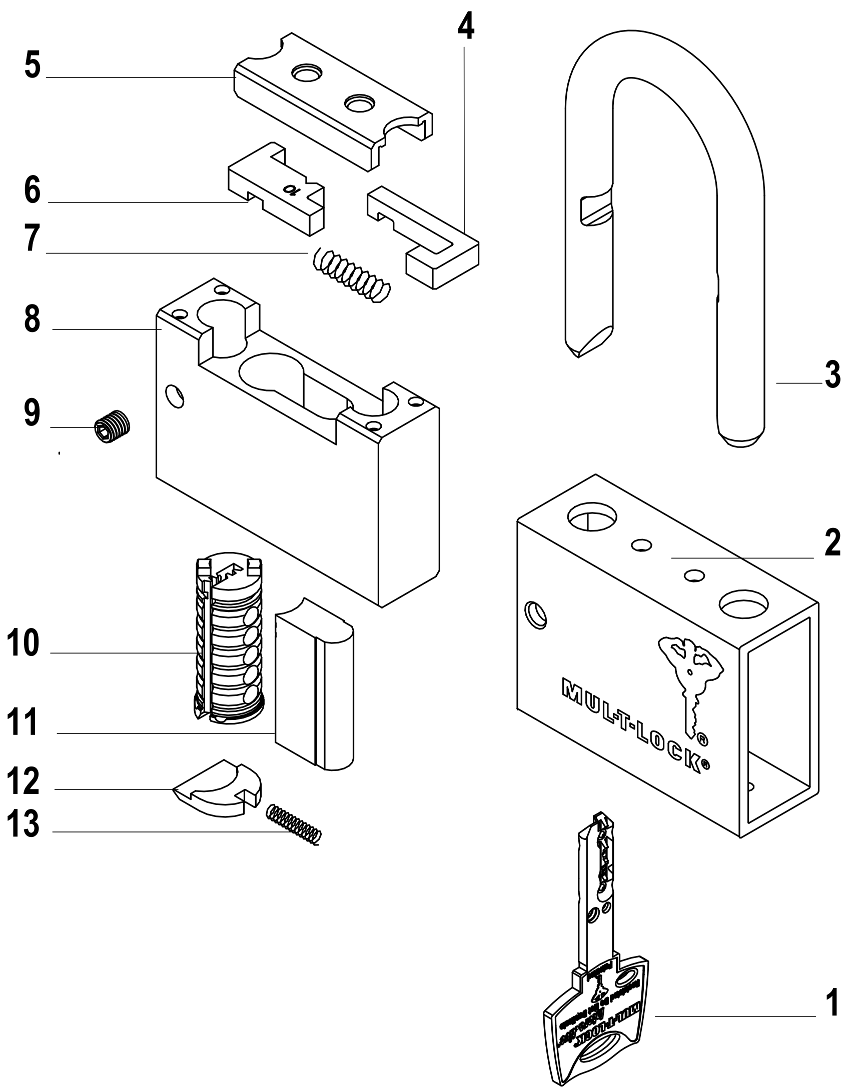
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4
The disassemble of the locking mechanism is not needed for rekeying ! Loosen socket set screw (7) and remove parts (8,9,10,11).



Tips for Assembly
Check that the mechanism work properly before inserting the bolt!

C-Series Padlock Removable Shackle No.10, No.13 & No.16



No.	Part	No.	Part	No.	Part
1	Key	6	Latch	11	Hive
2	Shell	7	Latch Spring	12	Dust Shutter
3	Shackle	8	Core	13	Dust Shutter Spring
4	Latch	9	Socket Set Screw M5		
5	Thrust Plate	10	Plug		

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C-Series Padlock

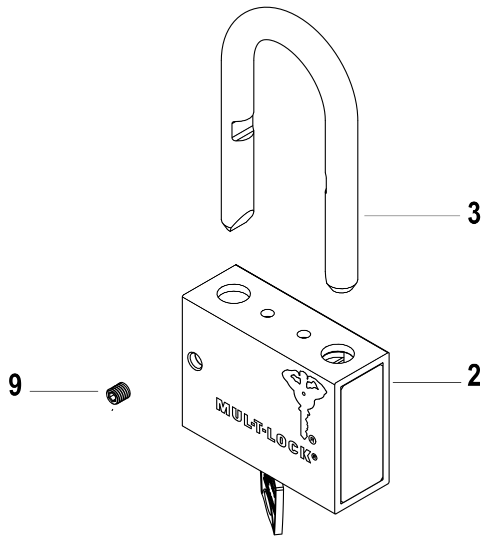
Removable Shackle No.10, No.13 & No.16
Disassembly Instructions

1

Unlock the padlock with the operating key.

Using a 2.5 mm Allen wrench, remove the set screw (9).

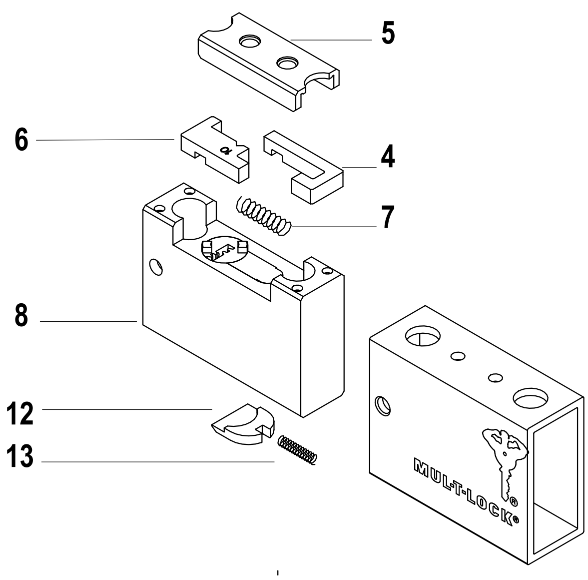
Remove shackle (3).



2

Take the key out.

Slide out core (8), making sure to carefully set aside the spring-loaded parts (4, 5, 6, 7, 8, 12, 13).



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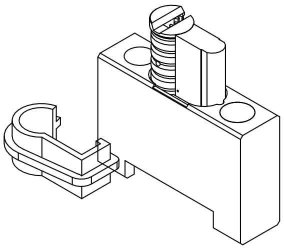
3

3

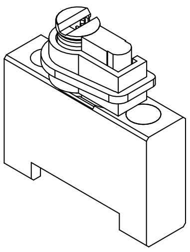
Turn the core upside down and pull out the cylinder so that the catch can be mounted.

NOTE: Do not pull the cylinder out of the core more than two-thirds of the way!

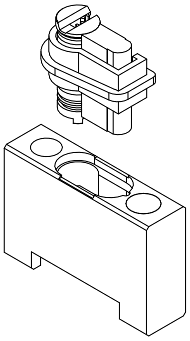
Mount the plastic catch and remove the cylinder.



a



b

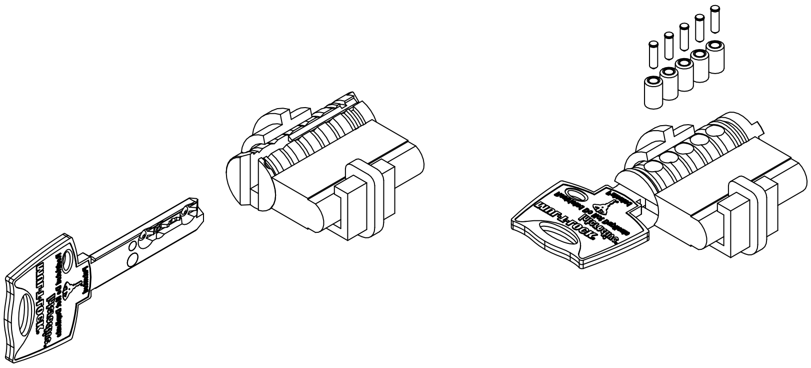


c

4

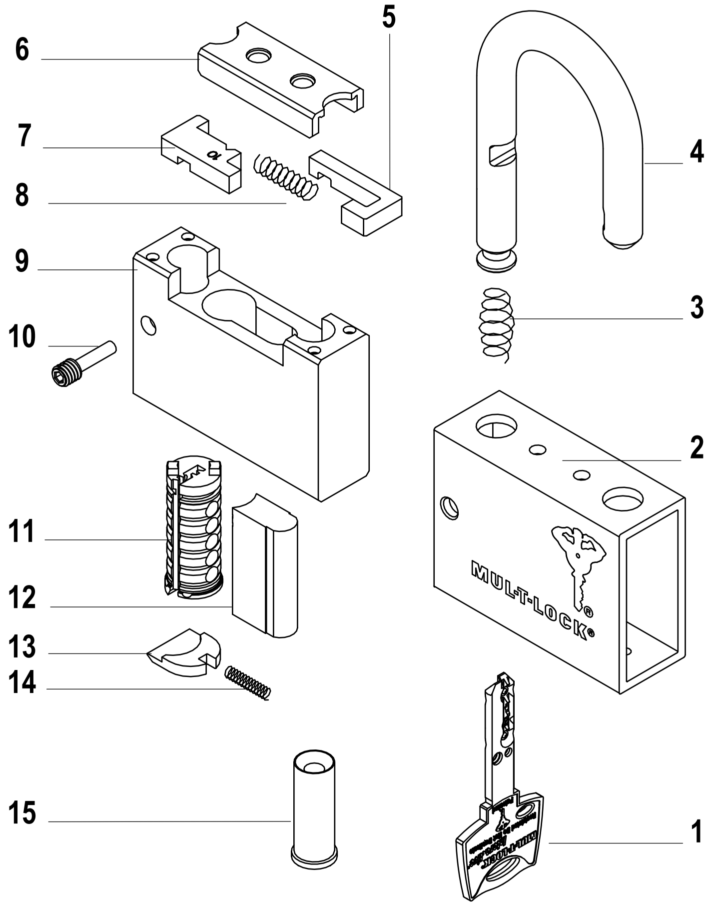
4

Insert the key into the cylinder and turn it until the pins can be removed from the plug.



ASSEMBLY TIP: Check that the mechanism functions correctly before inserting the shackle!

C-Series Padlock Pop-Open Shackle No.10, No.13 & No.16



No.	Part	No.	Part	No.	Part
1	Key	6	Thrust Plate	11	Plug
2	Shell	7	Latch	12	Hive
3	Shackle Spring	8	Latch Spring	13	Dust Shutter
4	Shackle	9	Core	14	Spring
5	Latch	10	Socket Set Screw M5	15	Hardened Pin

* M5

C190V1

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Pop-Open Shackle Disassembly Instructions

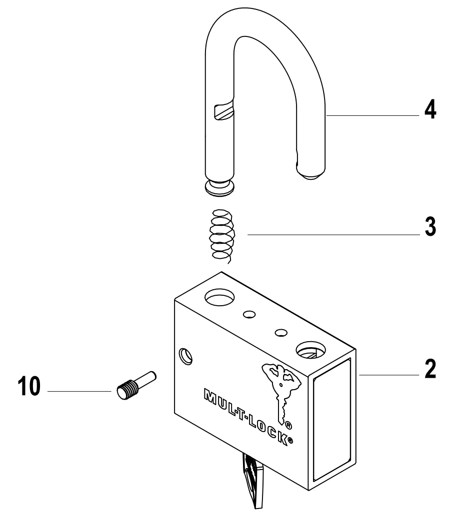
1

1

Unlock the padlock with the operating key.

Using a 2.5 mm Allen wrench, remove the set screw (10).

Remove shackle (4) and spring (3).

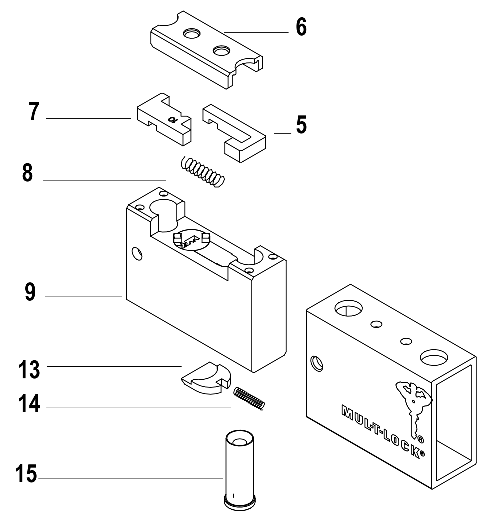


2

2

Take the key out.

Slide out core (9), making sure to carefully set aside the spring-loaded parts (4, 5, 6, 7, 8, 13, 14, 15).



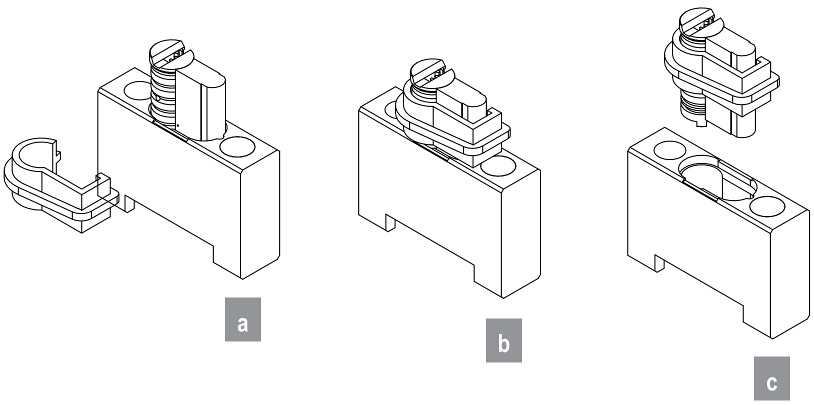
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3

3
Turn the core upside down and pull out the cylinder so that the catch can be mounted.

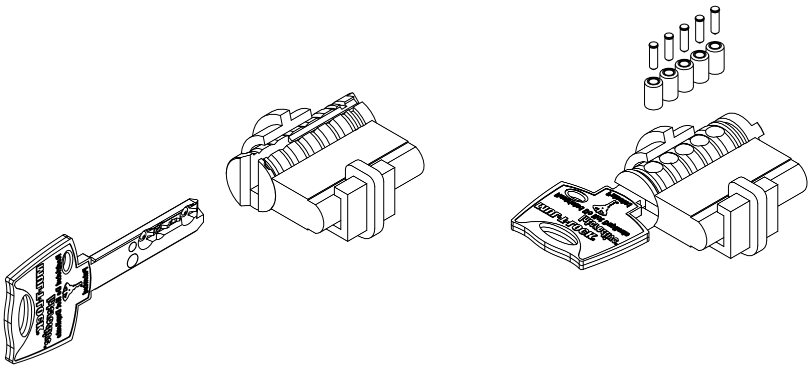
NOTE: Do not pull the cylinder out of the core more than two-thirds of the way!

Mount the plastic catch and remove the cylinder.



4

4
Insert the key into the cylinder and turn it until the pins can be removed from the plug.



ASSEMBLY TIP: Check that the mechanism functions correctly before inserting the shackle!

C-Series Padlock Conversion between Removable Shackle and Pop-Open Shackle

1
To convert a removable shackle lock into a pop-open shackle lock, change socket set screw (9R) to socket set screw (10P).

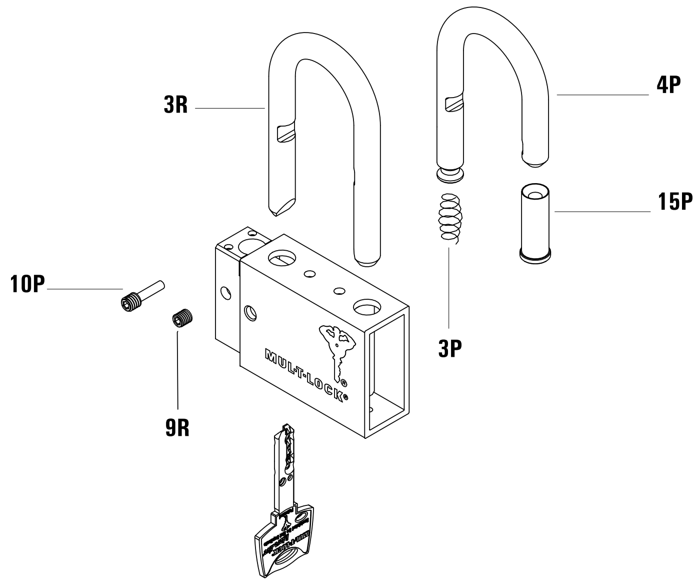
Replace removable shackle (3R) with pop-open shackle (4P).

Add hardened pin (15P) and spring (3P).

2
To convert a pop-open shackle lock into a removable shackle lock, change socket set screw (10P) to socket set screw (9R).

Replace pop-open shackle (4P) with a removable shackle (3R).

Remove hardened pin (15P) and spring (3P).

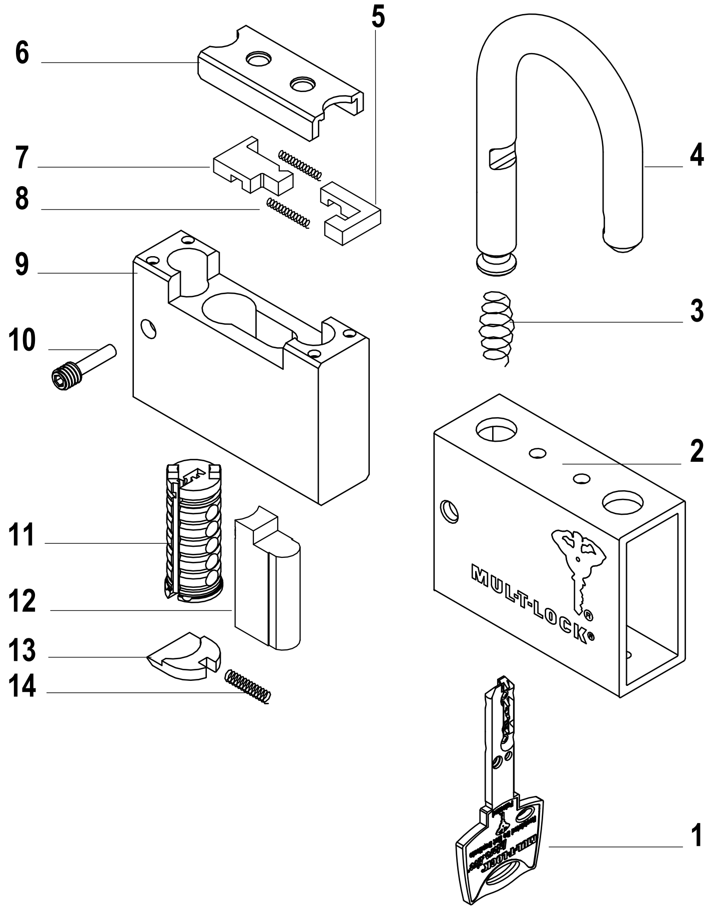


NOTE:
R: removable shackle part
P: pop-open shackle part

For assembly, look in Assembly Instructions and Exploded Views pages for types P and R.

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C-Series Padlock Pop-Open Shackle No.8



No.	Part	No.	Part	No.	Part
1	Key	6	Thrust Plate	11	Plug
2	Shell	7	Latch	12	Hive for C8
3	Shackle Spring	8	Latch Springs	13	Slider
4	Shackle	9	Core	14	Spring
5	Latch	10	Socket Set Screw M5		

* M5

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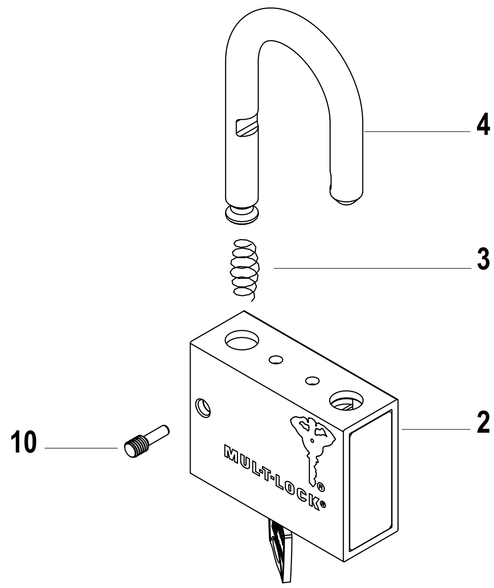
Pop-Open Shackle No.8 Disassembly Instructions

1

Unlock the padlock with the operating key.

Using a 2.5 mm Allen wrench, remove the set screw (10).

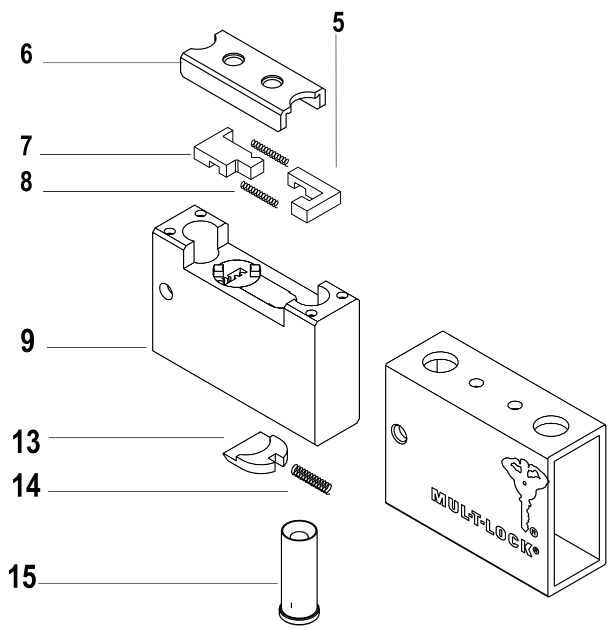
Remove shackle (4) and spring (3).



2

Take key out.

Slide out core (9), making sure to carefully set aside the spring-loaded parts (5, 6, 7, 8, 13, 14, 15).



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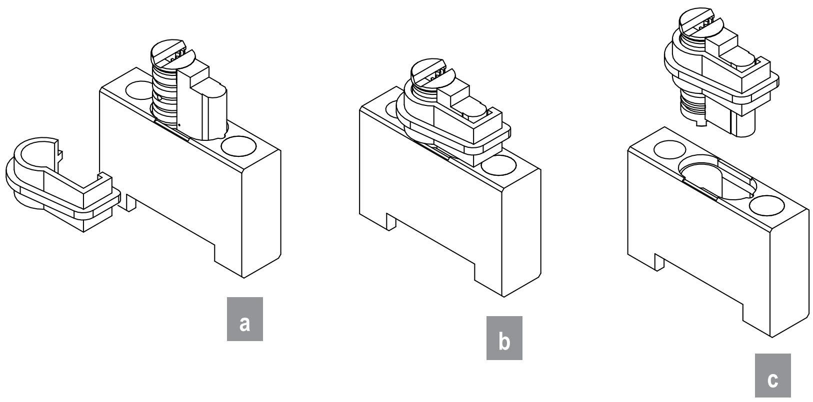
C Series Padlock

Pop-Open Shackle No.8
Cylinder Service

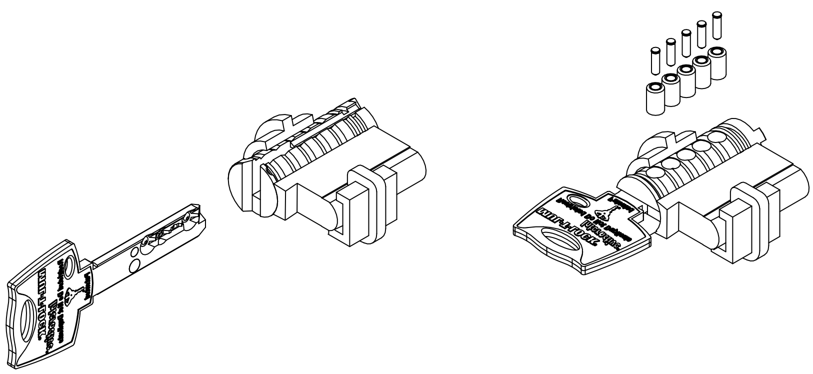
3
Turn the core upside down and pull out the cylinder so that the catch can be mounted.

NOTE: Do not pull the cylinder out of the core more than two-thirds of the way!

Mount the plastic catch and remove the cylinder.

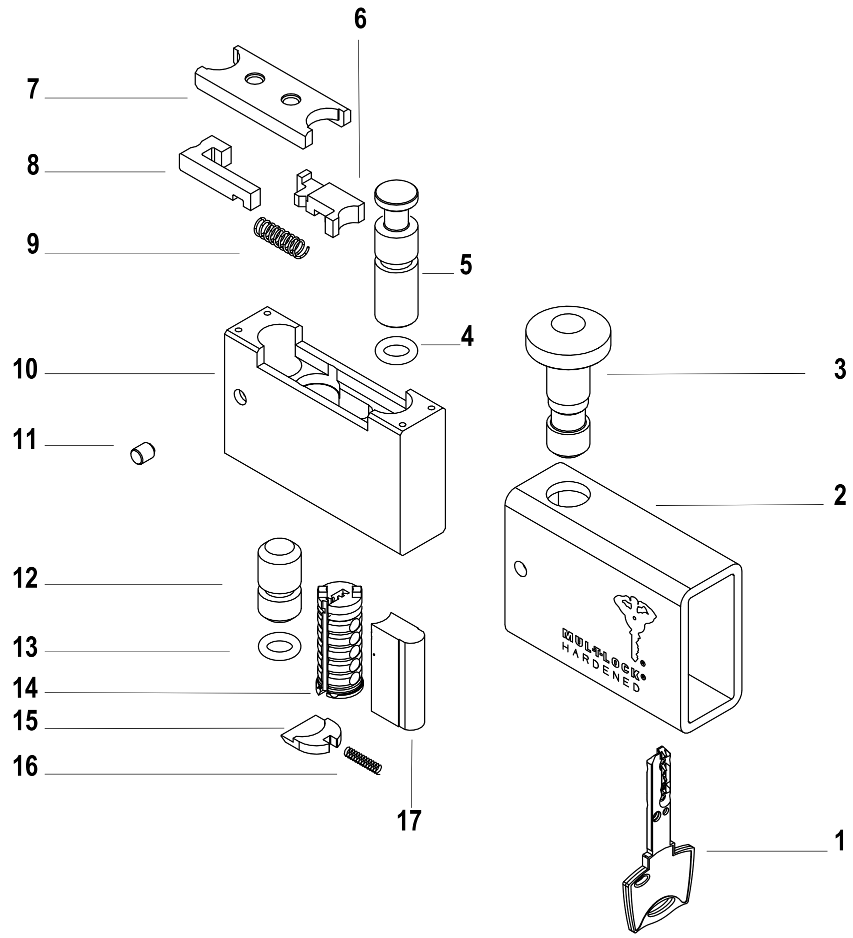


4
Insert the key into the cylinder and turn it until the pins can be removed from the plug.



ASSEMBLY TIP: Check that the mechanism functions correctly before inserting the shackle!

C-Series Padlock Single Pin



No.	Part	No.	Part	No.	Part
1	Key	7	Thrust Plate	13	O-Ring
2	Shell	8	Latch	14	Plug
3	Locking Pin	9	Latch Spring	15	Slider
4	O-Ring	10	Core	16	Spring
5	CTL Pin	11	Socket Set Screw M5	17	Hive
6	Latch	12	Lower Pin		

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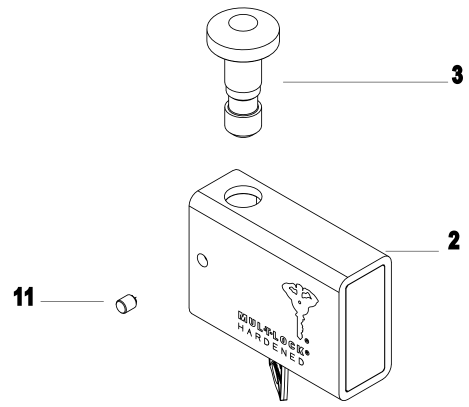
Single Pin Disassembly Instructions

1

Unlock the padlock with the operating key.

Using a 2.5mm Allen wrench, remove the set screw (11).

Remove locking pin (3).

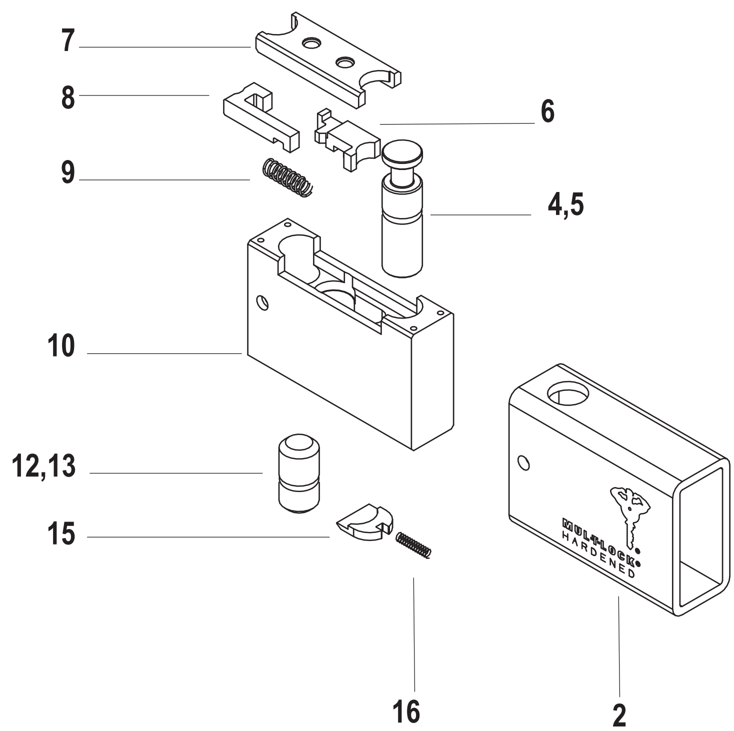


2

Take key out.

Slide out core (11), making sure to carefully set aside the spring-loaded parts (5, 6, 7, 8, 13, 14, 15).

Remove pins (5, 12).

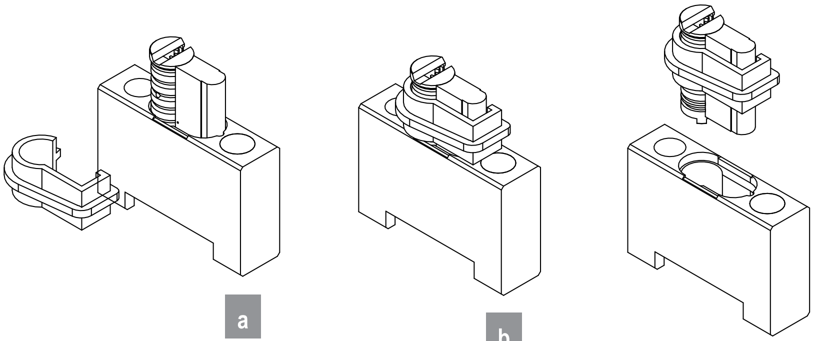


3

Turn the core upside down and pull out the cylinder so that the catch can be mounted.

NOTE: Do not pull the cylinder out of the core more than two-thirds of the way!

Mount the plastic catch and remove the cylinder.

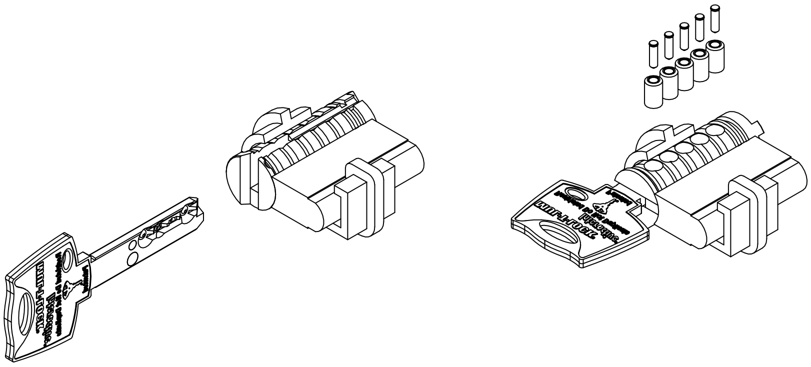


a b c

3

4

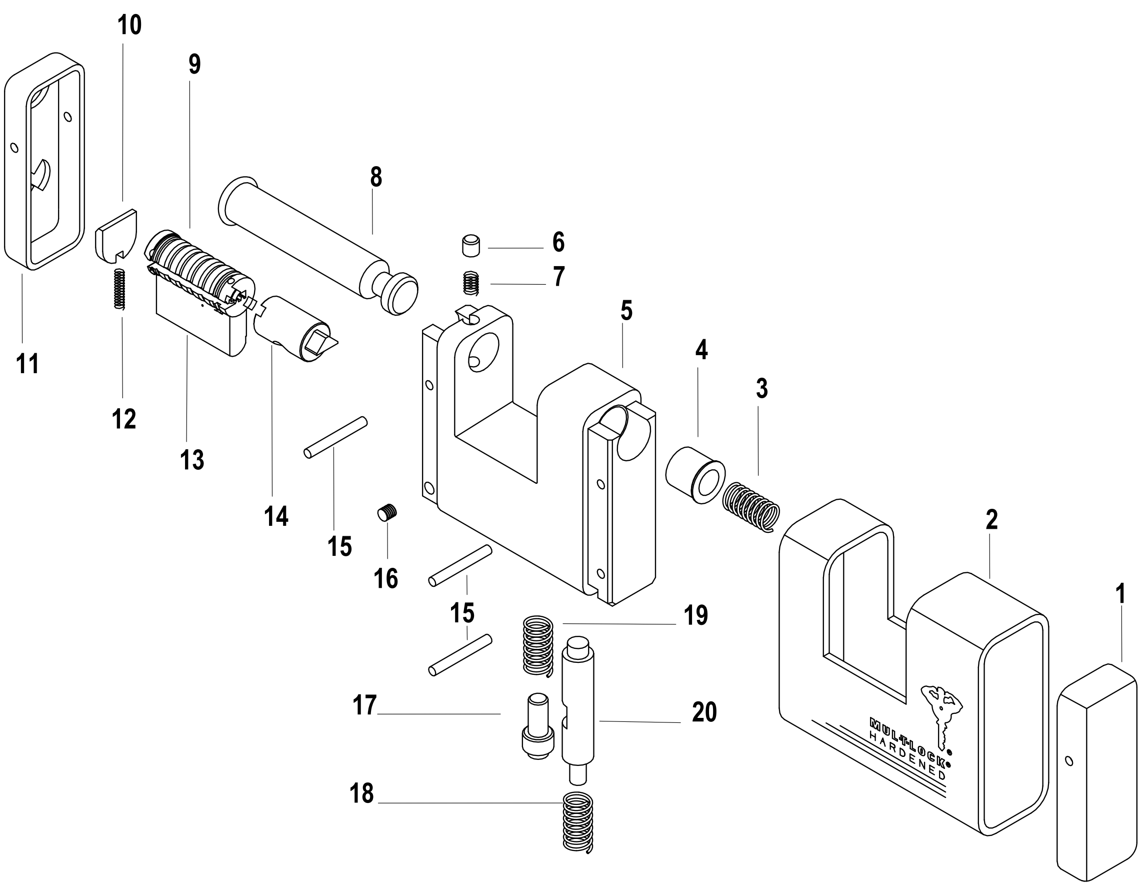
Insert the key into the cylinder and turn it until the pins can be removed from the plug.



4

ASSEMBLY TIP: Check that the mechanism functions correctly before inserting the shackle!

C-Series Padlock C-35 Sliding Bolt



No.	Part	No.	Part	No.	Part
1	Rear Protecting Plate	8	Bolt	15	Steel Pin
2	Shell	9	Plug	16	Socket Set Screw
3	Spring	10	Rear Protecting Plate	17	Grooved Pin
4	Bolt Pusher	11	Dust Shutter	18	Spring
5	Core	12	Spring	19	Spring
6	Stopper	13	Hive	20	Latch
7	Spring	14	Adaptor		

C290V1

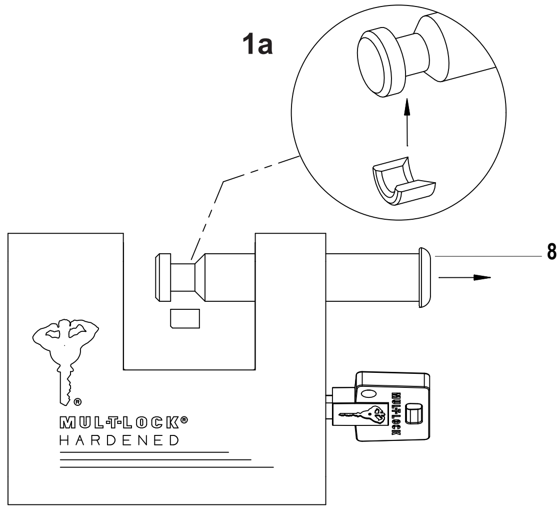
C-35 Sliding Bolt Disassembly Instructions

1

Unlock the padlock with the operating key.

Mount the disassembling ring onto the bolt as shown.

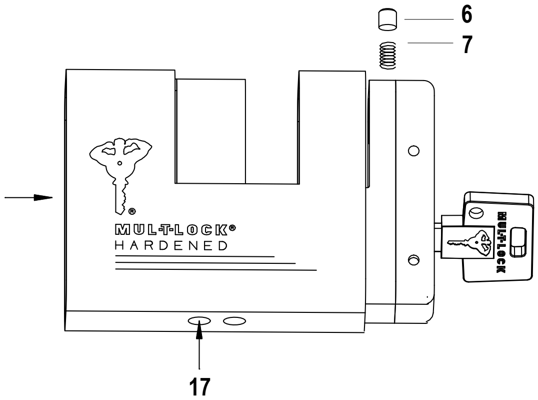
Remove the bolt (8) by pulling it out .



2

Remove pin (6) and spring (7).

Push grooved pin (17) up while sliding core out

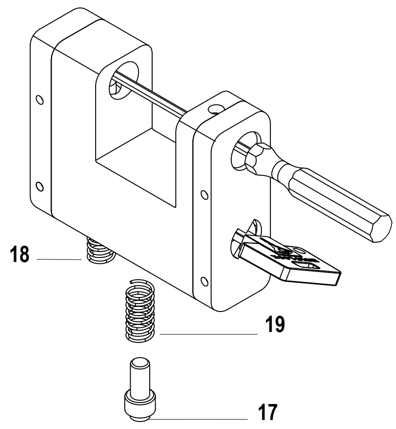


3

Remove grooved pin (17) and spring (19).

To take key out, apply force on spring (18), insert screwdriver and push inside bolt pusher (4).

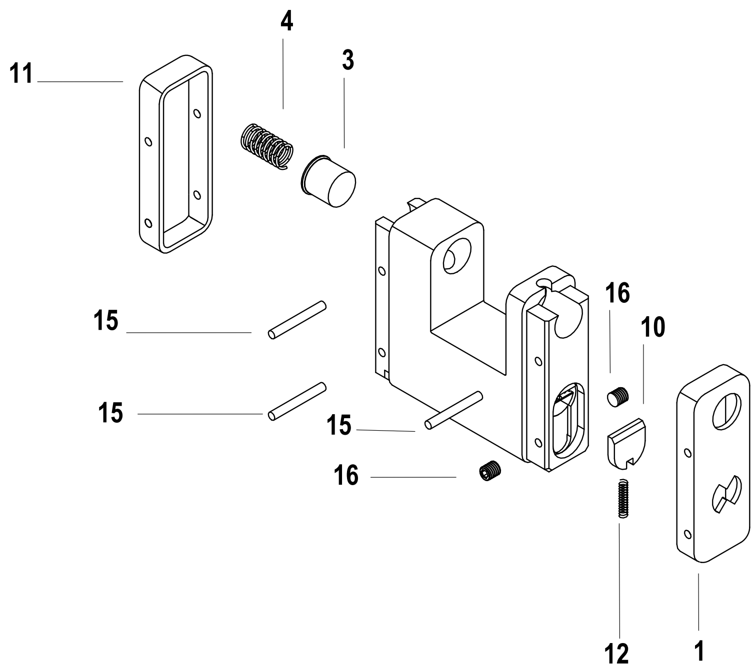
Key will return to closed position and can be taken out.



4

Remove three pins (15) and two screws (16).

Remove parts 1, 3, 4, 10, 11, 12.



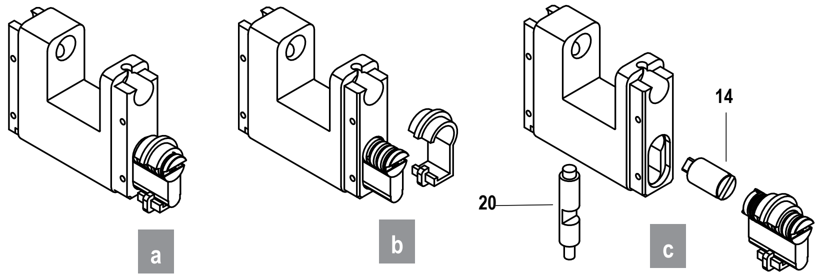
5

5

Turn the core upside down and pull out the cylinder so that the catch can be mounted.

NOTE: Do not pull the cylinder out of the core more than two-thirds of the way!

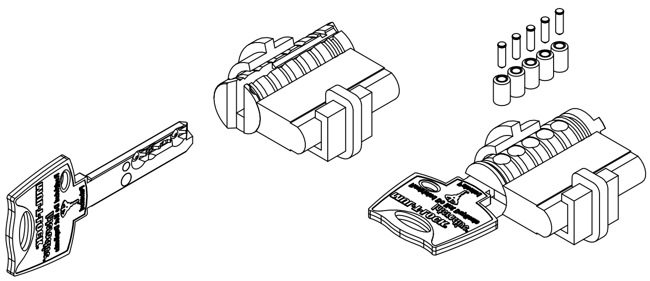
Mount the plastic catch and remove the cylinder.



6

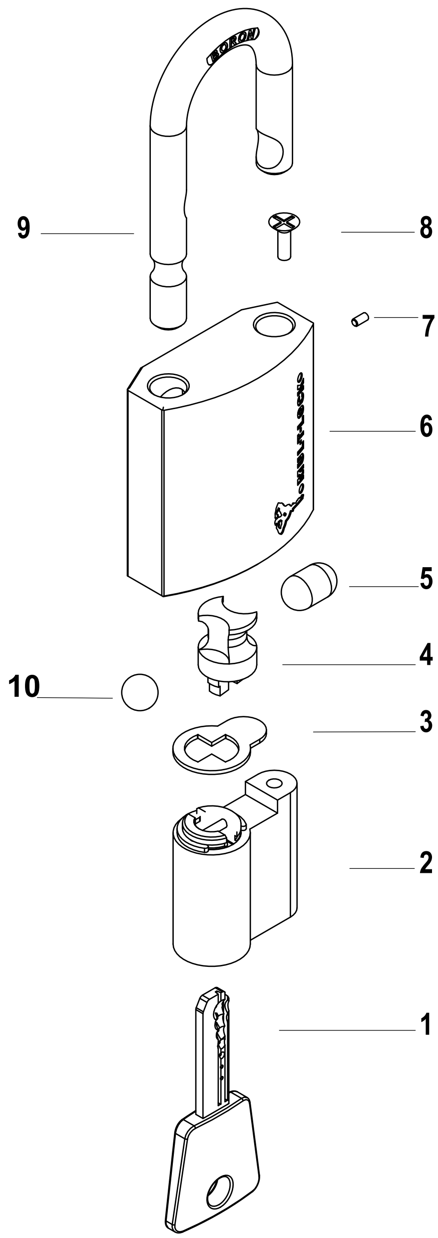
6

Insert the key into the cylinder and turn it until the pins can be removed from the plug.



ASSEMBLY TIP:
Latch (**20**) goes inside before adaptor (**14**).

G-Series Padlock G-47

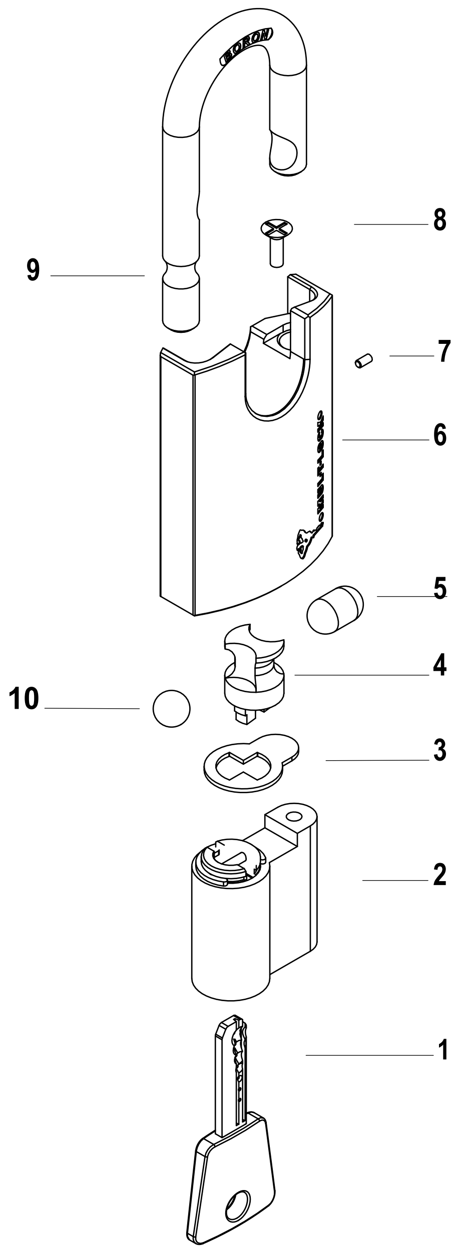


No.	Part	No.	Part	No.	Part
1	Key	5	Latch*	9	Shackle
2	Cylinder	6	G-47 Body	10	Ball Bearing
3	Cam Limiter	7	Security Pin		
4	Cam Activator	8	Screw		

* Elongated ball bearing

C330V1

G-Series Padlock G-47P

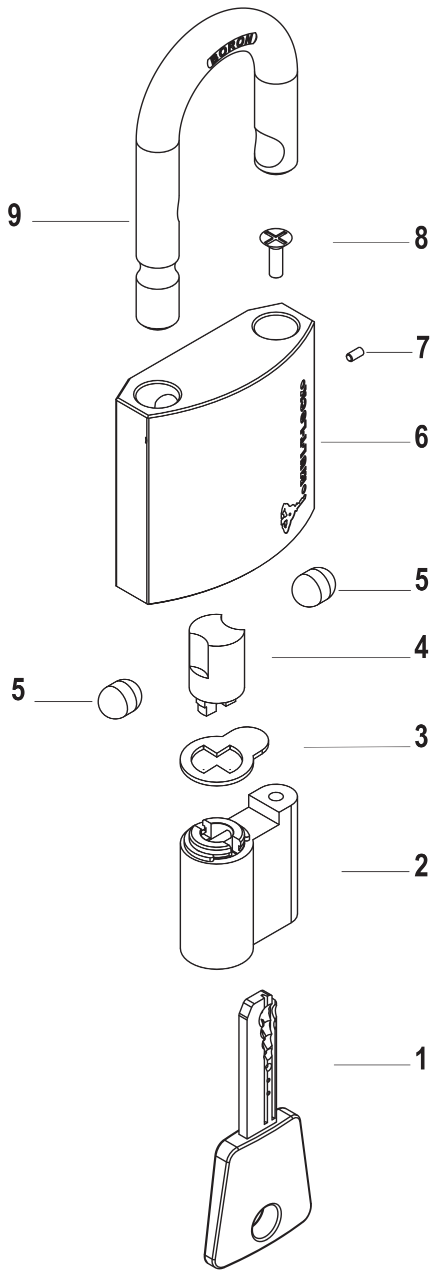


No.	Part	No.	Part	No.	Part
1	Key	5	Latch*	9	Shackle
2	Cylinder	6	G-47P Body	10	Ball Bearing
3	Cam Limiter	7	Security Pin		
4	Cam Activator	8	Screw		

* Elongated ball bearing

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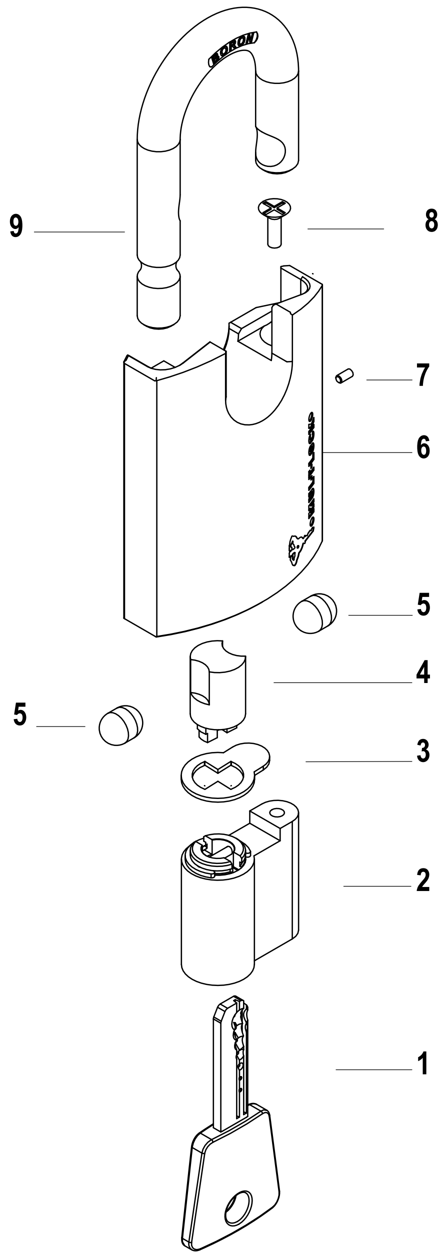
G-Series Padlock G-55



No.	Part	No.	Part	No.	Part
1	Key	4	Cam Activator	7	Security Pin
2	Cylinder	5	Latch*	8	Screw
3	Cam Limiter	6	G-55 Body	9	Shackle

*Elongated ball bearing

G-Series Padlock G-55P

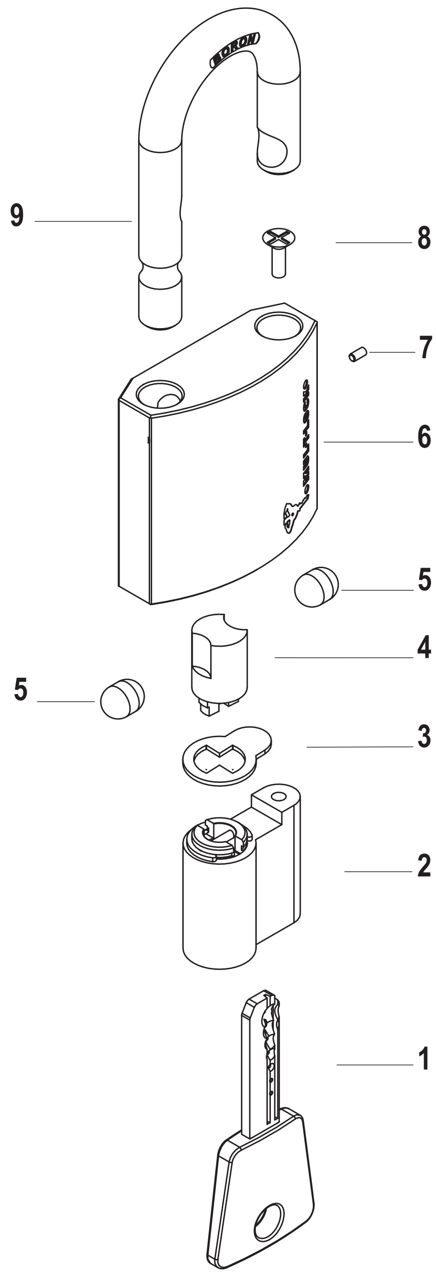


No.	Part	No.	Part	No.	Part
1	Key	4	Cam Activator	7	Security Pin
2	Cylinder	5	Latch*	8	Screw
3	Cam Limiter	6	G-55 Body	9	Shackle

* Elongated ball bearing

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G-Series Padlock G-60



No.	Part	No.	Part	No.	Part
1	Key	4	Cam Activator	7	Security Pin
2	Cylinder	5	Latch*	8	Screw
3	Cam Limiter	6	G-60 Body	9	Shackle

* Elongated ball bearing

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C370V1

G-Series Padlock Assembly Instructions

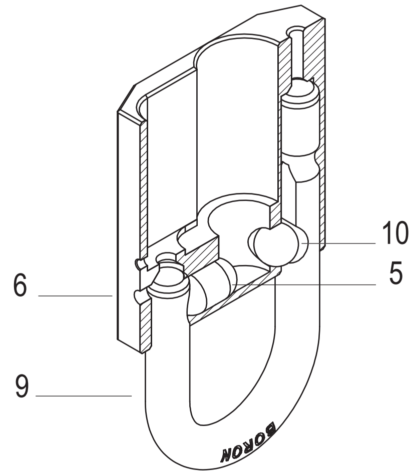
These assembly instructions are intended to walk you through the assembly process, starting with the padlock disassembled. If you start dismantling an assembled lock, please refer to the next page for instructions on removing the security pin.

1

With the shackle (9) inside, hold the padlock body (6) upside-down.

Push the two elongated ball bearings (5 for G-55 padlocks; 5 & 10 for G-47 padlocks) through the cylinder opening, one per side.

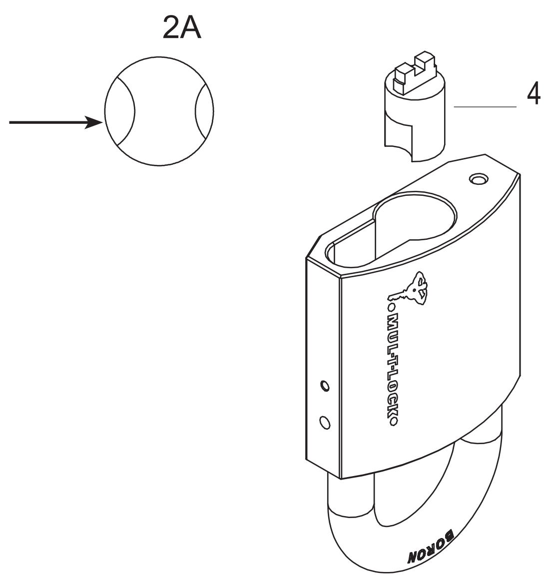
NOTE: For G-47 models, ensure that the elongated ball bearing (5) is placed in the direction of the short leg of the shackle.



2

Insert the padlock activator via the cylinder opening.

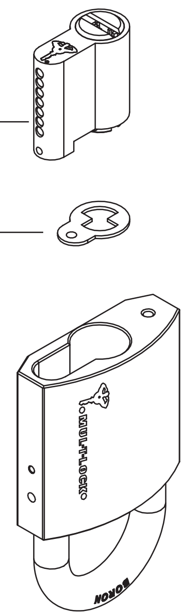
NOTE: for G-47 Models make sure that the deepest of the two recesses is facing the short leg of the shackle.



3

Insert the limiter plate (3), ensuring that it engages with the protrusion of the activator (4).

Insert the cylinder (2) into it's place, making sure that the key will be at it's removal point when the padlock is locked!

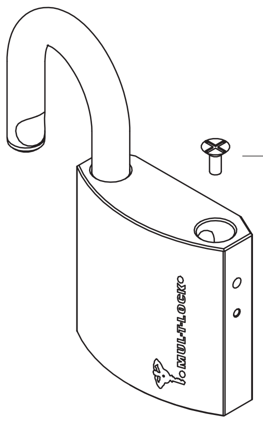


4

Put the cylinder holding screw (8) into its place.
In order to prevent it from working loose, secure it with a drop of "lock tite".

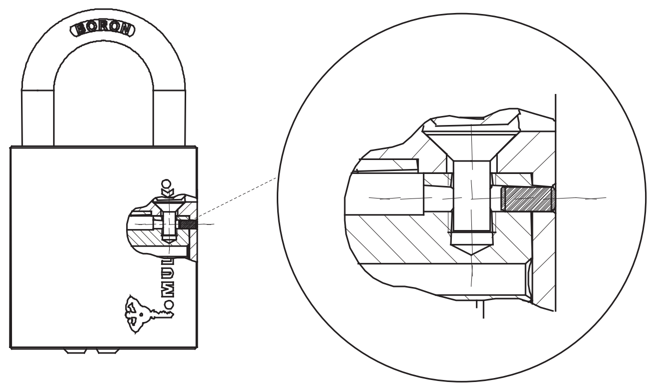
For additional safety, use the security pin (7) as described on the next page.

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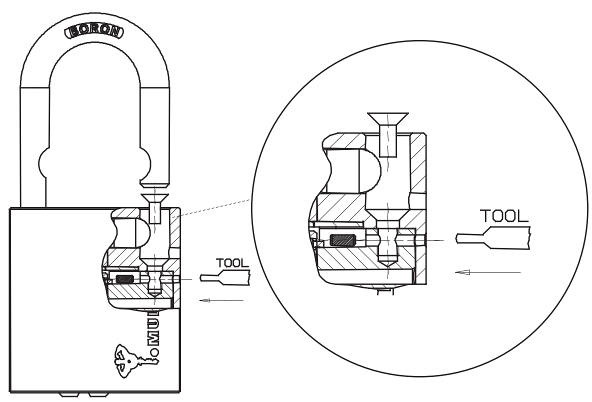
Assembly Instructions for Security Pin

1
Unlock the padlock with the operating key. Reach for the cylinder mounting screw through the shackle hole with a philips driver; release and remove it. This will not release the cylinder, which is still held by the security pin!



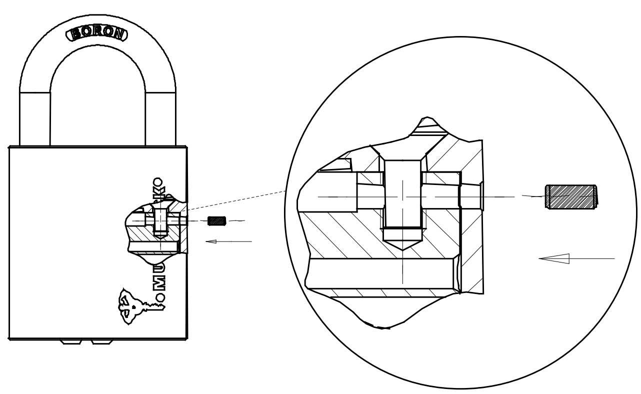
1

2
Once the screw is no longer in place, use a punch and drive in the pin, which will fall into the cavity above the cylinder. The cylinder can now be removed, and you can recover the pin for re-assembly.



2

3
Assemble the cylinder in position with the mounting screw and tighten. Check the lock for correct operation; once confirmed, drive the security pin home with a small hammer. The pin end should be flush with body outer surface as per figure 1.

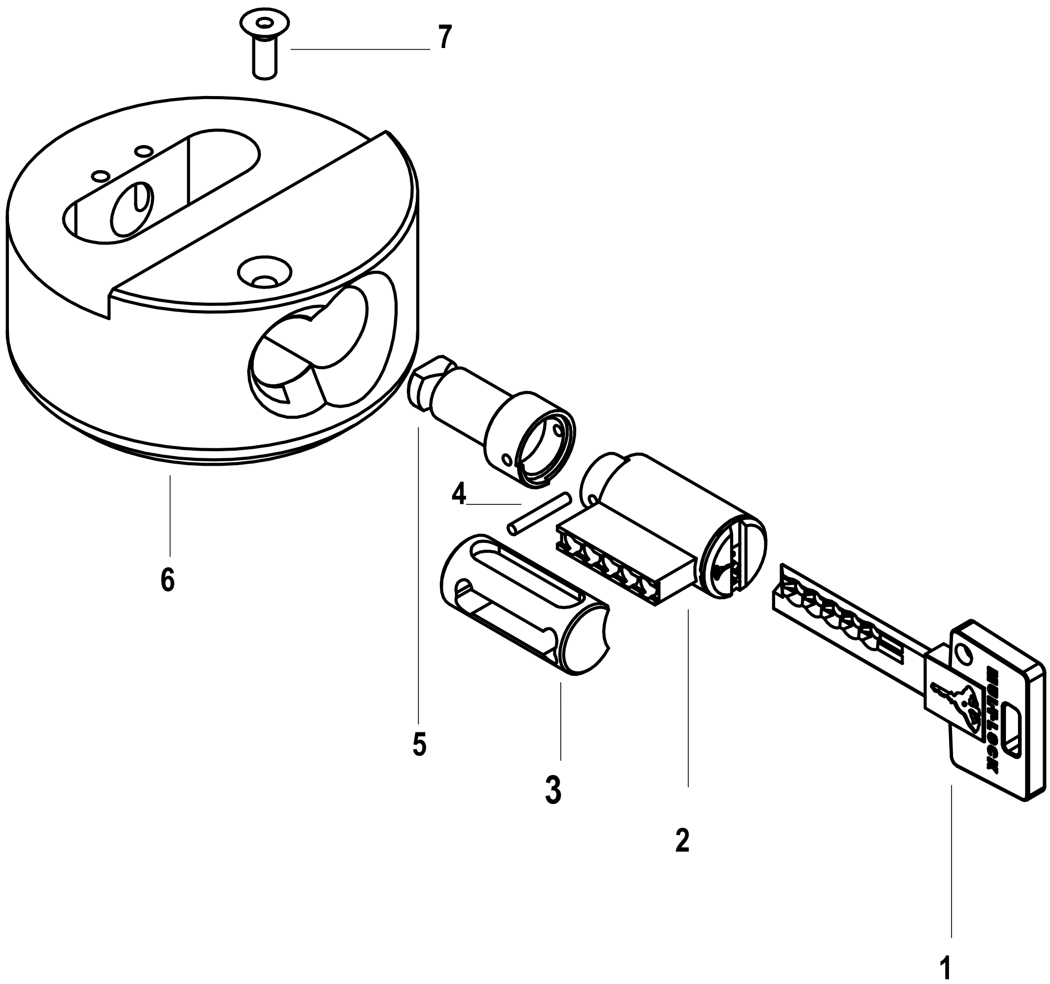


3

MUL-T-LOCK®
An ASSA ABLOY Group Company

Service Manual

Round Padlock Hockey Puck Type



No.	Part	No.	Part	No.	Part
1	Key	4	Connecting Pin	7	Screw
2	Cylinder	5	Bolt		
3	Cylinder Base	6	Padlock Body		

*Not available in E-8 ** M3: for E-8 and E-11
M4: For E14 and E-18

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